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156.

MEMOIRS OF THE GEOLOGICAL SURVEY.

ENGLAND AND WALES.

THE GEOLOGY OF
THE COUNTRY NEAR
LEICESTER.

(EXPLANATION OF SHEET 156.)

BY

C. FOX-STRANGWAYS, F.G.S.

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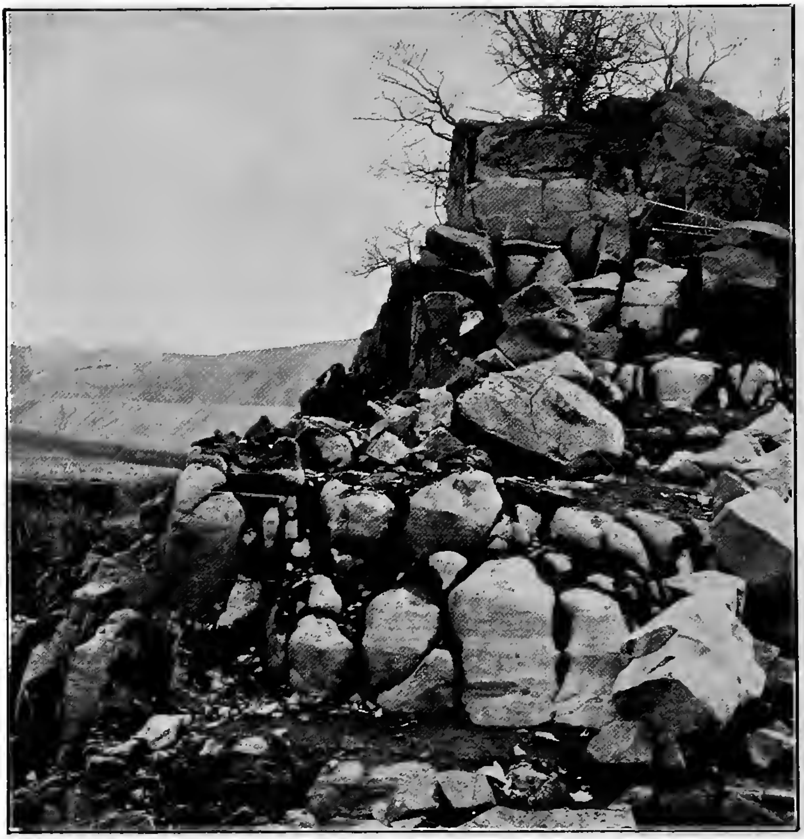

HAWCLIFF HILL, MOUNTSORREL.
Crags of Granite, shewing horizontal grooving.
From a Photograph by W. T. Tucker.

156.

MEMOIRS OF THE GEOLOGICAL SURVEY.

ENGLAND AND WALES.

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E.V.

PREFACE.

THE area described in the present Memoir is contained in Sheet 156 of the New Series one-inch Map of England, and embraces parts of central and eastern Leicestershire, and of the adjoining county of Rutland. It includes most of the area represented in the quarter-sheet 63 N.E. of the Old Series Geological Survey Map, which was surveyed by Mr. H. H. Howell and published in 1855; also the northern part of quarter-sheet 63 S.E. surveyed by Mr. W. T. Aveline and Mr. H. H. Howell and published in 1859, together with a small descriptive Memoir published in 1860; and the north-western part of Sheet 64, surveyed by Prof. J. W. Judd and Mr. W. H. Holloway and published in 1872, together with a Memoir issued in 1875 on "The Geology of Rutland."

The area is also referred to in the Memoir on "The Triassic and Permian Rocks of the Midland Counties of England" by Prof. Hull published in 1869.

A comparison of Sheet 156 of the New Series with the former Sheets of the Old Series, which it replaces, will show that considerable changes have been made in the delineation of the geology of this part of the Midlands. The outcrop of the granite and other old rocks in the neighbourhood of Mountsorrel has been shown with more exactness than was possible with the smaller scale map. The outcrop of the Rhætic Beds in this part of the Midlands has now been traced, and slight modifications have been made in the mapping of the Keuper Marl. The use of larger scale maps has also enabled the sub-divisions of the Middle Lias to be traced with more precision.

The Drifts have been surveyed in detail, for the first time over much of the area, and the most striking feature of the map is the evidence which it affords of their plateau-like character.

The present map differs again from the old map so far as the alluvium is concerned; the lines have been traced with greater accuracy in the main valleys and extended into the smaller valleys, thus bringing out more clearly the drainage system of the country. The river terraces are also shown. A new feature is the insertion of a longitudinal section to show the general structure of the ground.

The whole of the area has been surveyed by Mr. C. Fox-Strangways, who has prepared the present Memoir. The catalogue of fossils has been revised by Mr. E. T. Newton.

Manuscript copies of the six-inch maps have been deposited in the Office for reference, and copies may be obtained on payment of the cost of copying.

The Drift edition only of the map is colour-printed, but hand-coloured copies without Drift may be obtained at a cost of 3*s*.

A bibliography of Leicestershire was published in the Memoir on the geology of the country between Atherstone and Charnwood Forest and is not, therefore, included in the present Memoir.

J. J. H. TEALL.

Director.

Geological Survey Office,
28, Jermyn Street, London,
11th February, 1903.

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GEOLOGY

OF THE COUNTRY NEAR

LEICESTER.

CHAPTER I.

INTRODUCTION.

The sheet described in this Memoir contains an area of 216 square miles, the greater part of which lies in the County of Leicester, but it includes also a small portion of the County of Rutland. It covers the larger part of the area shown in 63 N.E. of the old one-inch survey, but extends nearly three miles further to the south; it also contains a considerable portion (72 square miles) of the ground covered by Sheet 64.

Owing to the Drift, which overlies the solid strata, being shown, this map has far more detail than the former of these sheets; and, owing to six-inch maps being now used, the lines can be drawn in with greater accuracy than was possible in 1872, when the eastern part was surveyed. Since the old surveys were made much additional information has been obtained. For instance, in 1855, when the district surrounding Leicester was surveyed, the Rhætic beds were not recognised, and were consequently included with the Lower Lias, a part of the outcrop at Leicester being entirely overlooked.

The only large town in the district is the county town of Leicester, but there are several important manufacturing villages, such as Mountsorrel, Sileby, Syston, Thurmaston, Wigston, Blaby, Narborough, and others along the valley of the Soar. In the eastern part of the map, the ground being entirely agricultural, the villages are not so large, but all are fairly prosperous, from the district being near the centre of the most famous hunting country. On this side the largest place is Billesdon, but there are quite thirty other villages that are of considerable importance.

Although the greater part of the drainage of the district is within the Trent basin, a large part of the water on the east side passes away to the Welland, and thence into the Wash. The watershed dividing these two runs from Ranksborough Hill, by Cold Overton, Knossington, Whatborough Hill, Tilton, Billesdon, Rolleston, and Carlton Curlieu. It rises to an elevation of over 700 feet between Billesdon and Tilton, but declines to about 500 feet at Ouston, and at the southern edge of the map. Near Kibworth, to the south of this, it is below the 400 contour line.

The physical aspect of the country is greatly influenced by the Drift. This, in former times, appears to have completely covered the district, and to have obliterated its older features, so that the surface of the land gradually declined in one broad sheet from the line of watershed. Along the outcrop of the Middle Lias between Burrow and Billesdon there must have been a pre-Glacial feature as fine as the present escarpment, where the fall in the ground was somewhat rapid; but beyond this there was a nearly uniform slope, which was so slight that the ground may be considered to have been nearly level. This plateau, which was lowest along the line of the present Soar valley, has been cut into by the tributaries of this stream; so that the present aspect of the country is that of a great plain intersected by numerous furrows, that have been carved out by the tributary streams. The same thing has taken place on the eastern side of the watershed, the present streams apparently flowing nearly along the same lines as they did before the deposition of the Drift, which they have cut through, leaving only patches on their flanks. The effect of this denudation is that the escarpment of the Middle Lias, forming the highest ground in the map, rises in a more or less abrupt bank, overlooking a general plain of lower ground to the west, which has been furrowed into a series of ridge-like hills by the numerous streams that flow down to the main Soar valley. To the east of the Middle Lias escarpment the ground falls away gradually towards the Vale of Catmos, in the centre of Rutland; but this is principally along the valleys, as the ridges between maintain a fair altitude to beyond the limit of this map.

The following table gives a list, in descending order, of the subdivisions of the strata:—

RECENT AND PLEISTOCENE	Recent and Post-Glacial		Alluvium.
			River gravels.
	Glacial		Valley Drift.
			Chalky Boulder-clay with intercalated beds of sand and gravel.
			Older Boulder-clay (upper part).
			Quartzose Sand.
			Older Boulder-clay (lower part).
			Older Sand and Gravel (?)
JURASSIC	Inferior Oolite		Northampton Sands.
	Lias	Upper Lias	Shales.
		Middle Lias	Marlstone Rock-bed (zone of *Ammonites spinatus*).
			Sandy shales and clays with ironstone, &c. (zone of *Am. margaritatus*).
		Lower Lias	Lower Lias Shales with limestones in the lower part.
TRIAS	Rhætic		Rhætic Beds.
	Keuper		Keuper Marl with lenticular sandstone beds and bands of gypsum.
PRE-CAMBRIAN OR ARCHÆAN	Charnian		Granite of Mountsorrel, and associated rocks.
			Slates, hornstones, and agglomerates of Charnwood Forest.

The older formations that come to the surface within the limits of the map occupy a very small space, but they have been proved to extend further beneath the newer rocks at Leicester and elsewhere. They include a small outcrop of the Pre-Cambrian slates of Bradgate Park, and the intrusive granite and other rocks of Mountsorrel, which form the fringe of the Charnwood Forest district. The principal formations, however, are the Trias and the Lias, which practically cover the whole of the district.

The Keuper Marl crops out along the Soar valley, covering a considerable area, but the most extensive formation is the Lower Lias, which crosses the centre of the district; between these is a narrow band of Rhætic shales which has now been mapped for the first time. This is followed by the Middle and Upper Lias, which cover the eastern part of the district, and form the higher ground that is found in that direction. A few isolated hills of Inferior Oolite rise here and there above the general mass of the Upper Lias Clay. Finally, the whole of these strata are more or less covered by Boulder-clay and sands, which have somewhat altered the general character of the country.

The soil of the country, being in the main derived from the underlying formations, is mostly clay of a very retentive character. It is diversified here and there by beds of sand and gravel, which render it much lighter. This is particularly the case with the alluvial gravel that occurs along the margin of the Soar valley, especially about Syston. In the eastern part of the area the Rock-bed of the Middle Lias, where not covered by Drift, also forms a light rubbly soil, that is the best arable land in the district. In consequence of the large proportion of heavy clay land the greater part of the country is devoted to grazing purposes, and is noted for its extensive pastures and its renown as a hunting district.

Although there is no coal mining in the country now under consideration, the proximity of the coalfields to Leicester, and their early connection by one of the first railways made in the kingdom, has enabled that town to become an important manufacturing centre.

A large industry, and one which has greatly increased of late years, is the quarrying of roadstone. This is actively carried on at Mountsorrel, where the granite forms an excellent material both for mending roads and for pavements; it is also used in the preparation of artificial flagstones. These quarries are very extensive, and, being connected by branch lines with both the Midland and Great Central Railways, a large amount of road-metal is sent away to other districts.

The Keuper Marl is extensively used along the Soar valley for the manufacture of bricks, and has entirely superseded the Glacial and Liassic clays, which were formerly worked to a small extent locally for this purpose.

There are no minerals of any importance. The Rock-bed of the Middle Lias contains a certain amount of ironstone, which has been tried at Tilton: but, from the abandonment of the works, it does not appear to have been of much value. The Inferior Oolite is also very ferruginous, but the area covered by the rock is too small to be of any importance.

A thick bed of gypsum occurs in the Keuper Marl at Thurmaston, and other bands of this rock have been met with in borings; but it does not appear to have been used commercially in this district, although extensive works exist further north, between Kegworth and Gotham.

There is no building stone of any value. The soft white sandstone of the Keuper to the west of Leicester, the limestone bands in the Lower Lias, the Rock-bed of the Middle Lias, and the Inferior Oolite have been used, but they are generally too soft and friable for the purpose. Some of the new bridges on the Melton and Market Harborough Railway are built of the hard fossiliferous blocks ("jacks") of the Middle Lias, and appear to stand fairly well.

The limestone bands in the lower part of the Lias, from which the well-known cement at Barrow is made, are worked for lime at Kilby Bridge, but the beds are more shaly and impure than at Barrow. These beds have also been worked on the Crown Hills near Leicester, but the quarries are now abandoned.

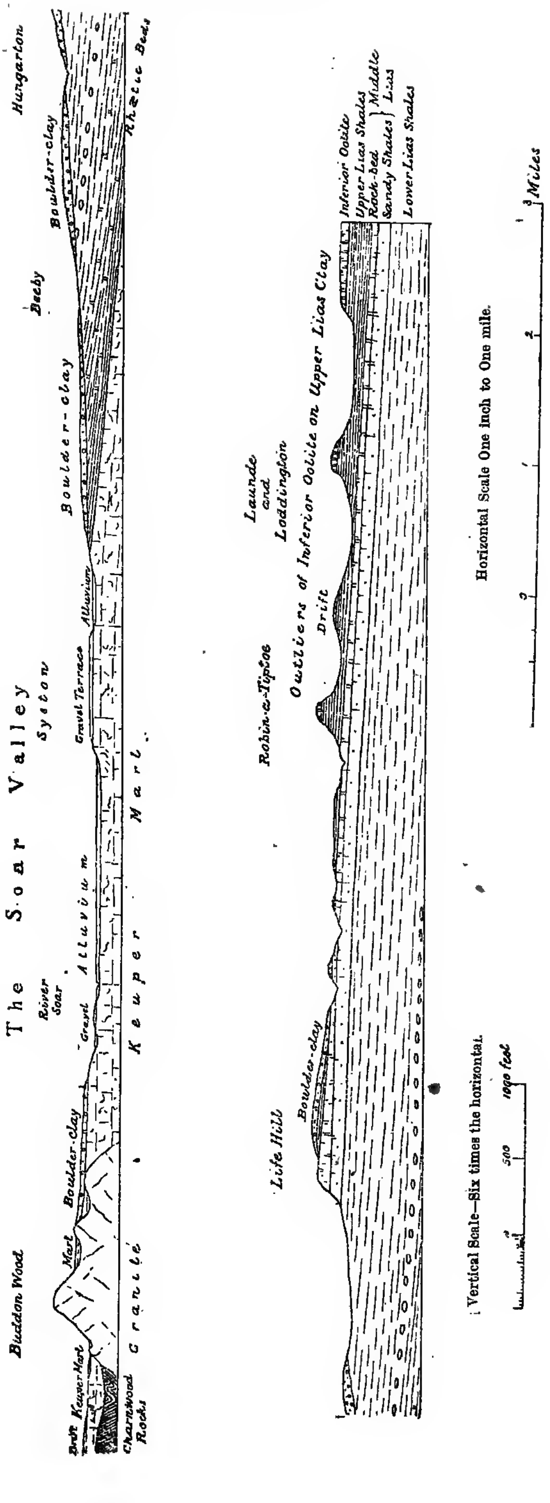
Beds of sand and gravel occur at numerous places throughout the area, especially along the Soar valley, about Knossington and Tilton, and further south. The gravel was formerly, in the country districts, the usual material for road-mending, but now it is entirely superseded by "granite," except for purely local purposes. The sand is, of course, still used for mortar, large quantities being excavated near Leicester, where the building trade is very active.

The water supply of a district like this, which has been derived chiefly from superficial deposits resting on impervious clays, is neither abundant nor good. For this reason the rapidly growing town of Leicester, which has been supplied by catchment reservoirs in the neighbourhood, is now seeking to obtain water from the far better but distant Carboniferous rocks of the Peak district of Derbyshire. When this scheme has been carried out the western portion of the area under consideration will have an admirable supply.

By considering the subject of the water-bearing properties of the rocks of this district we shall see why it has been necessary for Leicester to seek its supply from another source. The Keuper Marl with its subordinate bands of sandstone, when bored into, is usually found to yield a considerable amount of water; but, owing to the quantity of gypsum contained in these rocks, it is so impregnated with sulphate of lime as to be too hard for domestic purposes.

In the limestones and shales of the Lower Lias the supply of water is usually very scanty, and the shaly beds are so full of decomposing pyrites that the water is generally strongly impregnated with sulphuretted hydrogen,

FIG. 1.—*Section showing the general position of the strata across the area from north-west to south-east.*



The Rock-bed of the Middle Lias, being very porous, furnishes a copious supply, which is probably the best water in the district, but from the ferruginous nature of the rock it is liable to be strongly impregnated with iron; so that it is usually a strong chalybeate rather than a good water for domestic purposes.

The Upper Lias, from its generally impervious character, gives the poorest supply of any formation, as the water is only held in thin limestone bands; and from the pyrites in the shales it is not often fit to use.

The gathering ground covered by the Inferior Oolite is too limited to give a supply of any quantity, but good springs generally issue from this rock, although the water is liable to be rather ferruginous.

The sandy bands in the Drift frequently give good water, and no doubt may furnish a valuable source of supply; but the springs being only shallow, and the water being often conveyed for some distance between enclosing sheets of Boulder-clay, it is very liable to be contaminated by surface pollution, and great care should be used in the selection of sites for wells.

CHAPTER II.

PRE-CAMBRIAN.

On the western margin a small portion of these old rocks just comes within the limit of the map. These rocks were described by Professor W. W. Watts in the explanation of the neighbouring sheet (155); so that we need not devote much attention to them here. They constitute the main mass of the Charnwood Hills, but only the extreme eastern outcrop, just as it becomes buried beneath the Trias, is seen here.

Professor Watts has divided these rocks into the following series, but only the Swithland Slates and a part of the Bradgate beds are exposed in this map:—

Pre-Cambrian Rocks of Charnwood.

(*c*) The Brand Series	(*c*) Swithland and Groby Slates.
	(*b*) Conglomerate, Grit, and Quartzite.
	(*a*) Purple and Green Beds.
(*b*) The Maplewell Series.	(*e*) Olive Hornstones of Bradgate.
	(*d*) Woodhouse Beds: Hornstones and Volcanic Grits.
	(*c*) Slate-Agglomerate of Roecliffe.
	(*b*) Hornstones of Beacon Hill.
	(*a*) Felsitic Agglomerate.
(*a*) The Blackbrook Series:	Hornstones and Volcanic Grits.

These rocks protrude through the Keuper Marl in isolated knolls in Swithland Wood and Bradgate Park; and extend across the reservoir at Cropston, where they are last seen in this direction.

The Olive Hornstones of Bradgate are well represented in the Park, just beyond the edge of the map. "They are fine olive-green hornstones, devoid of coarser seams, but ashy in composition, and more or less fissile or slaty."

The Swithland Slates were formerly quarried at Swithland Wood and in the neighbourhood of Woodhouse Eaves. They are much heavier and rougher than the ordinary Welsh slate; consequently they are not now used except in a few instances where a more picturesque aspect is desired. These slates, which have a coarse cleavage, are purple or green in colour, and the best of them have a satiny or glossy texture.

Mountsorrel Granite and Associated Rocks.

Intimately associated with these slaty rocks is the granite of Mountsorrel and the neighbouring hills. It was shown in the description of Charnwood Forest, by Professor Watts, that the rocks of that district were traversed by numerous masses of syenite, which had been injected through the older strata. Probably a still later intrusion is the Mountsorrel granite, which, although about two miles from the main mass of the Charnwood area, is nevertheless connected with rocks of this age, a junction with altered slates being shown at the extreme south-west and north-west corners of the Mountsorrel group, although everywhere else the relation to the older rocks is hidden by the overlap of the Keuper Marl.

The granite crops out in several isolated knolls, the largest of which is the fine wooded eminence of Buddon Hill. Around this are grouped several smaller hills to the number of about twenty-two, varying in size from conspicuous hills like that at Mountsorrel to small patches, just rising through the Boulder-clay, not more than a yard or two in diameter. The rock is a pink biotite-granite; a full description of its mineral constituents has been given by Prof. Bonney* and by Mr. J. J. H. Teall.† It varies somewhat in composition, the easternmost exposure, at Mountsorrel being the most acid, while the westernmost, at Brazil Wood, is the most basic. Besides the pink felsitic veins by which this rock is frequently traversed there are several dykes of a more basic character. The principal of these is that seen in the old Mountsorrel quarry. This dyke runs in an east and west direction (W. 15° N.) across the quarry, and is 22 feet thick at the west end. It is seen again in the small quarry near the Cottage Hospital, where it is only 4 inches thick and dips at an angle of 45°. In the opposite direction, at Cocklow Wood, which is on the same line, we could find no trace of this rock, so that it probably dies out in both directions from its maximum width in the large quarry. Other dykes occur at Buddon Wood and Brazil Wood. About 80 yards west of the latter there is a curious mound of diorite, now concealed by the water of the reservoir. This is no doubt a portion of another dyke, but there is not enough seen of the rock to indicate its direction. This remarkable rock, which is unique in the district, is a plagioclase-hornblende rock with some pyroxene. It is coarsely crystalline, with large plates of hornblende that are very conspicuous.

Where the granite is in contact with the older rock, as at the two spots mentioned on the west side, the latter is greatly altered, and full of minute garnets. At Brazil Wood the rock, which might be called a mica-hornfels, is split up by numerous dykes for a distance of about 20 yards or more from the granite, which was evidently intruded at a very high temperature. A good section of these rocks was exposed here in the trench connecting the two hills at the time the reservoir was made, of which Professor Watts has supplied the following notes:—‡

"The intrusive rocks are entirely separate from the metamorphosed slate, but along the trench the beds are too much cut up by dykes to throw much light on progressive contact metamorphism. No unaltered rock occurs in Brazil Wood.

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* *Quart. Journ. Geol. Soc.* (1878), vol. xxxiv., p. 218.

† *British Petrography* (1888), p. 321.

‡ A fuller account will be given by Prof. Watts in his forthcoming Memoir on the Charnwood rocks.

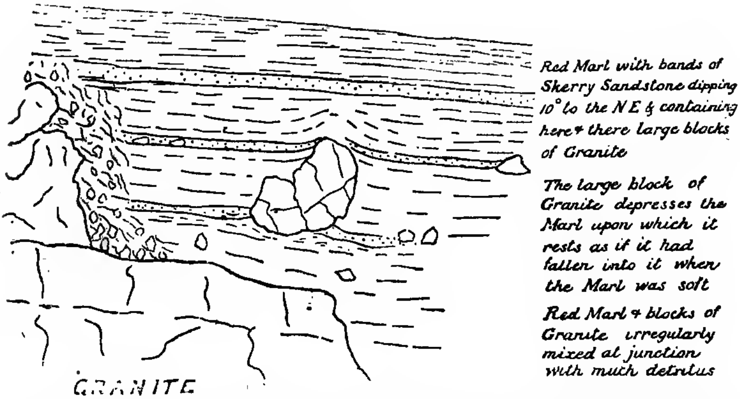
"The granitite of Kinchley is more basic than that of Mountsorrel, and contains plenty of hornblende in addition to brown mica. The rock of Brazil Wood is still more basic, and hornblende is always in excess of mica; it also contains much plagioclase (oligoclase or albite) in addition to orthoclase. The hornblende is in part brown and in part green—mostly compact, that is, not fibrous. The hornblende, mica, and felspar have consolidated before the quartz. Apatite and sphene are usually present. The dark rock is fine-grained, with porphyritic felspar set in a fine felspathic matrix. Hornblende and mica are present. The pink veins which seam this are chiefly micropegmatite, consisting of more acid 'mother liquor.' Some of the dark rocks contain so much hornblende and plagioclase that, if occurring alone, they would be called diorite. The contact rocks, which look like hard bands in the 'slate,' are fine-grained dykes from the granite. They contain felspar like the granite, but the matrix consists of rounded grains of quartz set in a very fine-grained felsitic matrix instead of irregular masses of interstitial quartz. The rock is almost devoid of hornblende or mica, and may be micropegmatite veins quickly cooled. The 'felsite' of the east end is of the same type. One of the hard veins in the slate is different, and contains abundance of crystals, probably of brown mica set in plagioclase with a little quartz, resembling the mica traps sometimes found in dykes from granite. The diorite differs in the deep brown colour of the compact hornblende and the presence of much fibrous actinolite, the small amount of orthoclase, and the absence of quartz.

"The altered rocks show no trace of the original clastic structure, and have been much altered. A few patches of aggregates of white mica occur, but not many recognisable crystals. The bulk of the rock is spotted and contains abundance of iron-ore dust. The lighter spots apparently consist of a felt of minute micaceous minerals separated by patches of brown matter also fibrous, which may be dark mica.

"The slate at the end of the trench is much more altered, and consists almost entirely of two kinds of mica with quartz in clear patches. All the minerals have been recrystallized. The spotted appearance is still preserved in places, but the light material consists of felted white mica passing into aggregates of larger crystals of the same, while the dark patches are now a pale olive brown pleochroic mica with inclusions of zircon, and passing in places into a dark brown mica. As the rock is not schistose it may be called (according to Mr. Teall) a mica-hornfels. No felspar has been detected. It is not more altered at the actual junction, except that the micas are larger and better formed. It also contains a brown biaxial mineral. The Buddon Wood contact-rock is full of minute garnets."

The junction of these isolated granite bosses with the surrounding Keuper Marl is found nearly everywhere to be very precipitous, and shows that they must have formed peaks and nearly vertical cliffs in the Triassic lake. At Mountsorrel, a well which is 50 yards from the edge of the granite, is sunk to a depth of 40 feet entirely in Keuper Marl.* At Hawcliff the edge of the granite goes sheer down to the bottom of the quarry, a depth of 20 feet or more. In the old brickyard at Nunckley there is a deep well within 30 yards of the granite. At the end of the reservoir embankment on the west side of Buddon Hill the edge of the granite was found to be very steep, and, in fact, wherever the junction of the two formations has been opened out it has been found to be of the same character.

FIG. 2.—*Junction of Keuper Marl and Granite at Mountsorrel.*


Red Marl with bands of Skerry Sandstone dipping 10° to the N E & containing here & there large blocks of Granite
The large block of Granite depresses the Marl upon which it rests as if it had fallen into it when the Marl was soft
Red Marl & blocks of Granite irregularly mixed at junction with much detritus
GRANITE

A curious feature of these granite cliffs was noted on the northern side of Hawcliff when the rock was first uncovered, a representation of which is given in the frontispiece.† The surface of the cliff here is scored with numerous horizontal lines and groovings, which are certainly not caused by glacial action, but are probably the result of the erosive power of sand driven by the wind, as is well exemplified in Iceland at the present time, where the lava is scored by sand-blasts in a similar manner.‡ These groovings are found beneath the undisturbed Keuper Marl as well as under Boulder-clay, thus showing that they must have originated in Triassic times.

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* Professor Bonney gives the depth of a well here as 100 feet.—*Quart. Journ. Geol. Soc.*, vol. xxxiv., p. 218.

† It was first described by Professor Watts, *Brit. Assoc. Rep.* for 1899, p. 747; see also *Proc. Geol. Assoc.*, vol. xvii. p. 379.

‡ H. J. Johnston-Lavis, *Scottish Geograph. Mag.* (1895), vol. xi., p. 465.

CHAPTER III.

TRIAS.

Keuper.

Although the Rhætic beds are now generally included with the Trias, this formation consists in the main of two great groups—the Bunter and the Keuper; these have been further subdivided into the several minor divisions as given below:—[*]

Keuper	Upper Keuper. Marl and Sandstone with beds of Gypsum.
	Lower Keuper. Sandstone with bands of Marl (Waterstones) and Sandstone, and breccia (Basement Beds).
Bunter	Upper Red and Mottled Sandstone.
	Conglomerate or Pebble Beds.
	Lower Red and Mottled Sandstone.

It will be seen, however, that it is only the higher of these divisions that are present in this district; in fact only the upper member of the Keuper crops out in this area, although lower beds have been proved in borings near Leicester. From these borings we learn that the full thickness of the Keuper beds averages about 700 feet, of which about 100 feet, more or less, may be classed with the Lower Keuper Sandstone.[†]

The upper member of the Keuper Marl has been separated into three divisions—an Upper Gypseous Series, Upper Keuper Sandstone, Lower Gypseous Series, but it is doubtful if these really hold good to any extent. The Upper Keuper Sandstone appears to occur in more or less lenticular masses, which thin out in all directions, and there is no evidence that this bed is so continuous and regular in its character as it has been supposed to be; consequently we shall treat the Upper Keuper Marl as one formation, merely alluding to the included sandstones when they are of sufficient importance to notice.

The Keuper Marl covers the greater part of the western half of the map; and, although it is largely covered by superficial beds, still a considerable area is to be seen in all the valleys and depressions of the district. It consists of thick beds of red and grey or tea-green marl, with numerous thin bands of gypsum, and shaly sandstone, which latter occasionally thickens out into more prominent beds of rather coarse gritty sandstone. The red colour of the marls is frequently bleached by organic matter; and in some places, more particularly in the neighbourhood of Kirby Muxloe, the red marls are full of grey markings, which traverse the rock in vertical and diagonal lines, and are due to the infiltration of acidulated water, which has deoxidised the marl. Occasionally the marl contains some peculiar nodular lumps, which are very hard, and seem to be formed of aggregations of sand. They fracture in transverse radiating planes, which are filled with crystalline mineral matter after the manner of septaria. These lumps are very conspicuous in the pit of the Star Brick Works, near Thurmaston.

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[*] This is the classification given by Professor Hull and adopted by the Survey, but of course it varies somewhat in different localities. See T. M. Reade, *Geol. Mag.*, 1889, p. 550.

[†] The details of these sections are given in the Appendix. The most reliable of them is that from the Crown Hills, near Evington, as this appears to have received a larger amount of attention at the time when the boring was made, and the cores are preserved in the Museum at Leicester.

The thickest beds of gypsum are towards the upper portion of the series, as shown by the numerous wells and borings in and near Leicester. The only bed, however, which can be traced at the surface is that seen in the railway cutting at Thurmaston, which has a thickness of from 6 to 10 feet. Beds of gypsum are mentioned by Jukes as having been worked at the old pits at Regent's Road, Leicester*; and they are recorded from most of the borings and well sections in and around the town. Gypsum has also been met with in considerable quantity beneath the Knighton Tunnel† and at the Humberstone Brick Works. In the borings at the foot of Spinney Hills several beds of gypsum are mentioned, one at Crown Hills being as much as 10ft. 6in. thick.‡

The principal bed of sandstone, which occurs a short distance below this horizon, is best exposed in the railway cutting of the branch line to Burton, where it has a thickness of over 14 feet, and in the quarry at Ashleigh House, near the Dane Hills, where there appears to be nearly 20 feet of this rock. This, however, is its maximum thickness, as it thins away from here in all directions. It is a massive false-bedded sandstone, but its separate grains are very loose and incoherent, so that on the Dane Hills it is quarried as a building sand. At Shoulder of Mutton Hill, on the Hinckley road, the rock is curiously pitted, and has dark spots, possibly manganese. At Buddon Wood it is full of drusy cavities filled with white crystals. In the quarry at Ashleigh House there is a good section in these beds, which has been figured and described by Mr. Montagu Browne.§

On the eastern portion of the Dane Hills, which is now built over, this sandstone is considerably thinner, and in the neighbourhood of the Fosse Road appears to die out almost entirely. An excavation at the corner of the Fosse Road and Hinckley Road, of which a representation is given below, showed this dying out of the sandstone and its passing into more marly beds very clearly, and proved that it does not pass beneath this portion of the town, as has been supposed.

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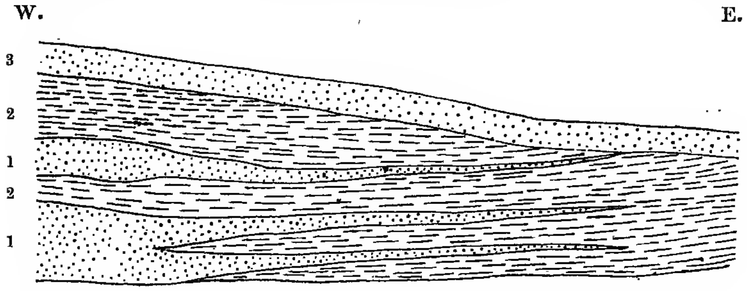
* Professor J. B. Jukes, the *Analyst*, vol. viii., 1838, p. 7. Montagu Browne, *Trans. Leicester Lit. and Phil. Soc.*, vol. iii., p. 123.

† Montagu Browne, *loc. cit.*, p. 196, note 89.

‡ See Appendix, p. 65. In the first boring at Lodge Farm there is a bed of gypsum said to be 20 feet thick; but we doubt the accuracy of this, as it is not mentioned in the second boring, which was only 3 feet distant.

§ *Loc. cit.*, p. 131.

FIG. 3.—Section about 50 yards east of the junction of Hinckley Road and Fosse Road, Leicester.



3. Soil, 1 foot.
2. Grey marly beds and flaggy "skerry" (thinning westwards).
1. White gritty sandstone (thinning eastwards).
Section about 6 or 7 feet deep.

The shales and flaggy beds mixed with marl and containing a few streaks of coarse sandstone, on which the main part of the sandstone rests, occupy most of the surface to the east, and are exposed in nearly every ditch, field-pond, or other excavation. In the new channel of the River Soar, which was made to carry off the flood water, these flaggy sandstones were so hard that the rock had to be blasted. These shaly beds, with the flaggy sandstones, locally called "skerry," were included, in the old survey, with the principal mass of coarse sandstone; but as the latter is of some economic importance, while the former is of no value whatever, we have considered it better, in the present case, to ignore them, and in mapping to group them with the red marl. They, however, occupy a fairly definite horizon, their outcrop in this map roughly following the course of the River Soar. These beds have been exposed in numerous excavations on the west side of the river at Leicester; they dip to the east, and pass beneath the main part of the town; where, having been met with in numerous borings, they have been mistaken for the coarse sandstone of the Dane Hills, the so-called Upper Keuper Sandstone. They are also seen to the south of the town, and in the brickpits at Sileby. In a number of sections beneath the town, given by Mr. James Plant in the Reports of the British Association for the years 1875, 1878, 1880, and 1889,* this sandstone is stated to vary from 20 to 45 feet in thickness, but there is no doubt that this is an error brought about by including the alternations of thin skerry sandstone and hard grey marl in one thick bed of sandstone, as pointed out by Mr. Browne in the following remarks upon this subject.† "[The sections in Leicester do not bear out the theory] that a certain definite horizon obtains for thick-bedded sandstones, emanating from the west, and passing under the town. Indeed, little or no thick beds of sandstone occur after leaving the western district, and what little does occur is found at all levels, and would be, perhaps, better described as 'skerries,' by which is meant an impure sandstone charged with marl, or occurring as sandstone streaks between marls of any colour and which may be fairly thick, but, unlike pure thick sandstones, such as those of Dane Hills, are of no value for building. . . . Probably the explanation is that sandy 'skerries,' some little true sandstone, and hard grey cuboidal marls occur out of the sandstone district at any horizon, and that engineers, when well-sinking, cannot be expected to be very particular in their rendering of 'sandstone,' and that very often any hard grey substances do duty for actual rock, and are 'lumped' together to fancy thicknesses."

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* See Appendix p. 75 *et seq.* † *Loc. cit.*, p. 153.

The coarse sandstone bed itself is seen at a few places along the line of outcrop, more particularly at Birstal, at Rothley, in the Fosse Road above Lewin Bridge, in the lane leading thence to Cossington, and in the village of Ratcliffe, where it again appears to be somewhat thicker. It also crops out at Narborough Wood House in the south-west corner of the map, where it covers an area of some extent, considering that the bed is stated to be only 1 foot 6 inches in thickness.

The sandstone, although very soft when first quarried, is said to harden on exposure to the air; and in former times appears, from the numerous old workings on the Dane Hills, to have been used to some extent as a building-stone, but it can never have been very well suited for this purpose, and at present is only employed as a building-sand.

At the top of the red marl there occurs from twenty-five to thirty feet of grey or tea-green marls, which were formerly included with the Rhætic beds above, but are now classed with the Keuper for the following reasons, as given by Mr. Strahan in a recent memoir on a part of the South Wales Coal Field* :—"In the first place, no line can be drawn between them and the Red Marls which does not include typical red beds in the green series, or green beds in the red series. The gradation from one to the other is perfect, even the green marls themselves being of the usual Triassic type except in colour. On the other hand, there is a definite plane of separation between the 'tea-green' series and the black shales in which the Rhætic fauna first appears. Marls of Triassic type, whether red or green, and the cavernous inorganic calcareous bands, occur below that place, while above it we find shales and thin limestones crowded with organic remains. The plane itself is not infrequently accompanied by an inch or two of conglomerate, consisting of quartz pebbles, rolled teeth and bone-fragments, which, without indicating an actual unconformity, points to an abrupt change of physical conditions. Taken in connection with the usually sudden appearance above it of the Rhætic fauna, it suggests the first complete invasion of the area by the Rhætic sea."

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* A. Strahan, Explanation of Sheet 249 (*Survey Memoir*), p. 71.

The tea-green marls are well seen in the brickyard at South Wigston, and have been exposed in numerous excavations near the Spinney Hills at Leicester. North of the town they form the steep bank on the east side of the Soar valley extending from Humberstone Asylum to Barkby Thorpe; but north of this they have only been met with in a few obscure sections.

In this district no organic remains, with the exception of fish-scales, and an insect-wing recorded by Mr. Harrison,* have as yet been found in the tea-green marl, and there is always a sharp line of division between them and the overlying black shales.

Very few organic remains have been recorded from the Keuper, and most of these, as one would naturally expect, occur in the sandstone. Several forms of plants have been mentioned, but they appear to be very imperfect, and it is doubtful if some of them are organic. The same may be said of the doubtful coral *Gorgonia keuperi*, discovered by Mr. John Plant,† which Mr. Browne does not consider to be organic.‡ Besides these, there are a few worm-tracks, teeth, spines, and scales of fish, and other vertebrate remains. A full list of these is given in the Appendix of Fossil Species.

Rhætic Beds.

At the top of the tea-green marls last described there is always a sharp line of division separating them from the dark finely-laminated shales of the Rhætic beds. This line of junction is usually occupied by a thin band of conglomerate having a peculiarly gritty feel, known as the Bone-bed. This bed, although sometimes absent, generally varies in thickness from half an inch to two inches or rather more. When met with at a little distance from the surface it is usually very hard and pyritic, but nearer the outcrop it becomes decomposed and much more brittle. It has the character of being a highly pyritous and impure sandstone full of the fragmentary remains of saurians and fish, together with fragments of Triassic sandstones, pebbles, and coprolites. Mr. Montagu Browne, in describing the sections on the west side of the Spinney Hills, gives the following account of this bed:—"There is a well-defined but friable bone-bed, varying from half an inch to two inches in thickness, with a dip of about 2° to the east, from whence have been procured bones and teeth of saurians, teeth and scales of *Colobodus*, scales of *Gyrolepis alberti*, teeth of *Saurichthys acuminatus*, *Acrodus minimus*, and *Hybodus cloacinus*; some of these, it will be seen, [were] unknown in Britain until discovered by Mr. A. E. Baker from the old Spinney Hill section on the New Evington side, and by the present writer from the new cuttings."§

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* Harrison, *Quart. Journ. Geol. Soc.*, vol. xxxii., p. 214.

† *Reports of the British Assoc.*, 1849, Trans. of Sections, p. 64.

‡ Browne, *loc. cit.*, p. 125, note 4.

§ Browne, *loc. cit.*, p. 174. In laying out the western slope of this hill for building during 1892 and 1893 numerous shallow sections in these beds were exposed, which have been described in great detail by Mr. Montagu Browne, p. 159, *et seq.*

The Bone-bed is succeeded by a thickness of about 17 feet of dark finely-laminated shales containing *Avicula contorta, Protocardium philippianum* (*P. rhæticum*), and other Rhætic bivalves in considerable abundance.

These pass up into a series of bluish or greyish shales having a thickness of about 20 feet, and which are not unlike the tea-green marls below.

The finest section of the Rhætic beds that occurs in this map is that seen in the brickyard at South Wigston, close to the Glen Parva Station, of which the following is a general account.

*Glen Parva Brickyard.**

		Thickness, approximate. Ft.	in.
Glacial	Boulder-clay with pebbles and Lias fragments. Very few, if any, flints.	20	0
Lower Lias -	Band of limestone (not on west side)-	2	2
Upper Rhætic Shales or White Lias	Bluish shales	20	0
	Band of limestone nodules	0	6
Lower Rhætic or *Avicula contorta* shales	Dark shales with a band of limestone nodules -	17	0
Keuper Marl	Grey marls	15	0
	Red marl	10	0
	Band of sandstone	1	0

The outcrop of these beds, where it enters the map at its southern edge, is very obscure, and, were it not for this fine section, would be scarcely recognisable. The Boulder-clay is so thick near here that these beds were not seen in the deep cutting where they cross the Midland Railway; but a little beyond this the black paper-shales have been met with in wells near Wigston Fields, and also in the valley close to Knighton Church. In making the sewer along the valley here nearly the whole series of these beds was exposed, the dark shales at the church passing up into grey shales capped with limestone nodules, which were seen in the lane close to the vicarage. North of Knighton the outcrop winds along the higher ground by Clarendon Park and Victoria Park to the Spinney Hills, but is entirely obscured by the thick covering of Boulder-clay.

At Spinney Hills we come to the typical sections where these beds were first described near Leicester by Mr. W. J. Harrison,† These sections are now all hidden owing to the extension of the town, but while the ground was being prepared for building we were able to obtain many useful notes; among others the following section was exposed on the west side of the hill:

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* More detailed measurements of this section are given by Messrs. Wilson and Quilter, *Geol. Mag.* Dec. 3, vol. i., p. 416, 1884. Also Montagu Browne, *Trans. Leicester Lit. Phil. Soc.*, 1901, p. 32.

† The occurrence of Rhætic beds here was first noted by Mr. J. J. H. Teall. See *Geol. Mag.*, 1874, p. 318.

*Section west side of Spinney Hills, near the north end of Haddon Street.**

	Ft. in.
Boulder-clay resting on a distinctly glaciated surface forming a marked line with striations. The Boulder-clay itself, with many striated surfaces or slickensides, contains mostly Lias fragments, a very few quartz pebbles, limestone fragments (striated), and one large sandstone block - nothing to	8 0
Dark laminated shale with selenite crystals, and much sulphur; yellowish, rusty-looking band at intervals, small *Protocardium philippianum*, and *Avicula contorta*, occasional jet-like streaks. Limestone nodules at east end - - - - - about	6 0
Bone-bed, varying in thickness from half inch to nothing.	
Tea-green or grey marls -	10 0 to 15 0

Dip, 3° E. A small fault throwing down to the north about 2 feet was observed on the west side.

The upper part of the Rhætic series, which has a thickness of from 6 to 10 feet, is composed of grey and buff sandy shales with very few fossils, it is a good deal stained by iron, and contains many small calcareous lumps (race). In the upper part of these shales there is usually one or more bands of cream-coloured nodular septariate limestone, from which *Estheria minuta* and a few other fossils have been obtained. The most complete section of the Rhætic beds in this neighbourhood was that afforded by the old brickyard at the northern end of the hill, of which the following account has been given by Mr. W. J. Harrison:—†

Section of the Rhœtic Beds, Spinney Hills, Leicester.

	Petrology.	Thickness. Ft. in.	Organic Remains.
10.	Soil and drift - -	1 0	
9.	Nodular band of limestone -	0 6	*Estheria* (casts), *Avicula contorta.*
8.	Light-coloured shales with sandy partings -	4 0	*Modiola minima*, *Avicula contorta*, *Cardium rhœticum* [*P. philippianum*].
7.	Dark shales with sandy partings - -	1 0	*Ophiolepis Damesii*, *Pholidophorus Mottiana.*‡
6.	Finely-laminated black shales	2 0	*Avicula contorta*, *Cardium rhœticum.*
5.	Sandstone -	0 1	*Axinus*-bed. Worm-tracks.

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* Compare woodcut on p. 47.

† *Quart. Journ. Geol. Soc.*, vol. xxxii., p. 213, 1876. The site of these brick-pits is now crossed by the streets known as Prospect Hill and Wood Hill.

‡ Doubtful species. See Table of Fossils.

Section of the Rhœtic Beds.–continued.

	Petrology.	Thickness. Ft.	Thickness. in.	Organic Remains.
4.	Black shales, coarsely laminated - - -	2	6	
3.	Bone-bed	0	3	*Gyrolepis*, *Saurichthys apicalis* [*S. acuminatus*], *Hybodus minor*, *Ceratodus*, *Nemacanthus monilifer*, *Ichthyosaurus*, *Plesiosaurus*, *Coprolites*, *Sargodon tomicus*, *Acrodus*, *Axinus* [*Schizodus*] *elongatus*, *A. depressus*.
2.	Light buff sandy marls with hard courses ; bluish nodules in lower part -	16	0	Fish scales, Selenite, Salt pseudomorphs.
1.	Red and blue Upper Keuper Marls - -	10	0	Selenite, Salt pseudomorphs.

It has been considered that this section did not expose the full thickness of the Lower Rhætic beds, and that the nodular limestone at the top was not *in situ*.* We see, however, no reason to doubt the position of this bed, having seen a similar limestone in small excavations on the west side of the hill, where it apparently occurs at about the same distance above the Bone-bed. If this band represents the lower nodular limestone of Wigston and other sections, the Lower Rhætic beds are here much thinner than in many other places, in fact not much more than half the thickness of what they are at Wigston, four miles to the south. It is also evident that in this locality the full thickness of these beds above the Bone-bed cannot be much more than 25 feet or so, as the outcrop of this bed in Dale Street† is only 20 feet below the top of the hill which is formed of the higher part of the Rhætic series. This is further shown by the shallow borings made in the southwestern corner of Spinney Hill Park and by the deeper borings to the east.‡

The upper limit of the formation was met with in cutting the sewer along the Mere Road, between Diseworth Street and St. Peter's Road, of this Messrs. Bates and Hodges have given an account, from which the following is abbreviated :—§

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* Wilson and Quilter, *Geol. Mag.*, 1884, vol. i., p. 417.

† Montagu Browne, *loc. cit.*, p. 170.

‡ See Appendix, pp. 67 and 72.

§ *Trans. Leicester Lit. Phil. Soc.*, 1886, p. 23.

Section on Spinney Hills, from Diseworth Street to St. Peter's Road.

	Petrology.	Thickness.	Organic Remains.
		Ft. in.	
	Glacial drift -	2 5 to 10 0	
Lower Lias.	Decomposed and hard blue crystalline limestone	4 0	*Cidaris Edwardsi*, *Pentacrinus* sp., *Ostrea* sp., *Lima* sp., *Pecten* sp.
	Yellow earthy limestone resembling the above, but less decomposed.	0 4 to 2 0	*Lima pectinoides*, *L. gigantea*, *Ostrea liassica*, *Pleurotomaria anglica*, *Am. torus*, *Am. catenatus*, *Nautilus striatus*, Wood, Spines.
	Thickly-laminated cream-coloured shales, with a thin band of limestone containing *Pholadomya*	4 0	*Modiola lævis*, *Pecten* sp., *Ammonites* sp.
Upper Rhætic.	Light-coloured marl with reddish stains. Very calcareous at top, with a thin nodular limestone	4 10	
	Blue marl	6 3	*Axinus cloacinus* [*Isodonta Ewaldi*].

The band of limestone 2 feet thick, thinning out to 2 inches, is considered by Mr. Montagu Browne to have been a boulder,* but although the beds were no doubt much broken up by glacial action we do not see, taking into account the character of the surrounding country, any reason to doubt the fact of their being *in situ*, the palæontological evidence notwithstanding. This would rather imply that the beds are higher in the series than has been supposed.

In the low ground to the east of the Spinney Hills the Rhætic beds cover a wider area than is usually the case, but are a good deal covered by alluvium and valley deposits. The dark paper-shales have been met with in wells and other excavations in the district known as New Evington and New Humberstone, which has enabled the outcrop to be traced with some degree of accuracy. These shales were found in the borehole at Lodge Farm, in sewers near the Great Northern Station, and below Humberstone Village.

In building the new asylum at Humberstone the lower part of the Lias was exposed; and a well 60 feet deep, which appears to have gone into the tea-green marl, passed through a nodular limestone at 34 feet, thus showing that the Rhætic beds here are somewhere about 20 feet thick.

Beyond this point the outcrop follows the brow of the hill, but the beds are not seen till we get to the little valley below the Humber

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* *Loc. cit.*, p. 172.

Stone. Here the outcrop is shifted by a small fault, so that dark shales are seen in the ditch below the farmhouse, while red marl occurs nearly to the summit of the rising ground to the north. Nothing is seen of the Rhætic beds in the valleys on either side of Barkby Thorpe, but on the intervening hill dark paper-shales were found along the ridge, which here forms a good escarpment. North of Barkby the Rhætic beds have not been seen, but from several exposures of red and grey marls it is evident that the outcrop runs back some distance up the Wreak valley, probably as far as Brooksby. Grey marls, which probably mark the top of the Keuper, are seen in the stream between Gaddesby and Queniborough, and in the hillside about a quarter of a mile north of the latter village. Grey marls and mottled clays are also exposed along the brook at Barkby, and about half a mile above the village, as well as at a few places in the fields between these two, close to the edge of the great mass of Drift which covers the country here. There is no doubt that the outcrop of the Rhætic beds follows the base of the Boulder-clay very closely along here, and that the greater part of the formation is just hidden by it.

North of the Wreak valley the outcrop is shifted about five miles to the west by a fault which brings in the Lias directly against the Keuper Marl along an east and west line running a little to the north of Thrussington and Sileby; so that Rhætic beds are not seen again till we reach the banks of the Soar at Barrow, in the next map. The absence of the Rhætic beds over the higher ground on the north side of the Wreak was proved in a well at the Roman Catholic college, where the Boulder-clay, which is about 80 feet thick, was found to rest directly on red Keuper Marl.*

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* See Appendix, p. 91.

CHAPTER IV.

LIAS.

The Lias is separable both from its petrological character and the nature of its organic remains into three distinct horizons, Lower, Middle, and Upper, each of which is further divisible into zones characterised by particular assemblages of fossils.

Professor Judd, who surveyed the country to the east, estimated that the total thickness of the Lias was about 800 feet, but from evidence which has since been obtained the maximum thickness of all three divisions must be at least 1,100 feet; and, even where some of the divisions are thinner, it cannot be much less than 1,000 feet thick. The Lias covers nearly the whole of the area E. of the Soar and Wreak valleys, but it is so much covered over by Glacial beds that it is not exposed over a large part of this area.

Lower Lias.

This division consists of a series of thin argillaceous limestone bands and shales in the lower part, and a thick series of clays or shale in the upper. It occupies a broad stretch of country on the east side of the Soar valley, extending as far as a line drawn from Whissendine to Burrow on the Hill, Billesdon, and Illston on the Hill. Over a large part of this district the beds are completely hidden by Boulder-clay; it is, therefore, chiefly beneath the Middle Lias escarpment, and along the numerous small streams flowing into the Soar, that exposures in the rock are likely to be met with. In the description of the country to the north-east it has been shown that the Lower Lias is divisible into four principal horizons,* viz.:—

The Clays above the Ironstone (*Zones of A. capricornus, A. Jamesoni, A. armatus*, and *A. oxynotus*).
The Ironstone Beds (Zone of *A. semicostatus*).
The Clays below the Ironstone (Zones of *A. Bucklandi* and *A. angulatus*).
The Strensham† or Limestone Series (Zone of *A. planorbis*).

In this map these divisions, owing to the thinning out of the Ironstone Beds, are not all of them so well marked, although the separation into the more numerous palæontological zones may be fairly carried out. These zones may be recognised wherever there are good sections; but the country, as we have said, is so thickly covered with "Drift" that it is only in a very few places that this can be done. Mr. H. E. Quilter, in describing the Lower Lias of the whole county, has divided it into the above eight zones‡; but, within the limits of this map, there are clear exposures of only three of these, although there are indications of the others.

The three highest of these, the zones of *A. capricornus, A. Jamesoni*, and *A. armatus*, have been by some authors included with the Middle Lias; but the reasons for and against this classification have been so fully discussed in other places* that we need not enter upon the subject here.

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* *The Geology of the south-west part of Lincolnshire* (Survey Memoir), p. 22.

† This name should not be used in future. See H. B. Woodward, *The Jurassic Rocks of Britain*, vol. iii., p. 146.

‡ *Geol. Mag.*, Dec. 3, vol. iii., p. 59.

In describing the outcrop of the Lower Lias it will be best to trace the lower portion first across the map, and then take the higher beds which are only exposed along a narrow tract of country below the Middle Lias escarpment.

The lower portion of the Lias is best seen just beyond the northern edge of the map, in the neighbourhood of Barrow, where the numerous pits that are constantly being worked for these valuable limestone bands afford a series of interesting sections. These pits, being opened nearly on the same horizon, are very similar to one another, and show the great uniformity there is in the character and thickness of the beds, the variations observed in them arising chiefly from their difference in position and depth. The following section, kindly supplied by Mr. Montagu Browne, gives a good idea of the general character of these beds at Barrow :—

General section of the lime pits at Barrow.†

Lithological character and local name.	Thickness. Ft.	in.	Organic Remains.
Soil and Drift -	3	0	
Argillaceous shale	5	0	*Schlotheimia angulata.*
Limestone (Bank Hurs) -	0	3	*Cidaris Edwardsi. Schlotheimia catenata.*
Shale (The Roak)	16	0	Plesiosaurian remains.
Limestone (Rummels)	0	10	Angulata zone. *Lima. Pecten.*
Shale (Rummels Calf)	4	0	*Psiloceras Johnstoni*, very abundant.
Limestone (First floor) -	0	6	*Psiloceras planorbe*, rare.
Shale (Second-floor Calf)	1	0	Ichthyosaurian remains. Various Fishes and Saurians.
Limestone (Second floor)-	0	6	*Palæotermes Ellisi.*
Shale (Hur Calf)	0	9	
Limestone (Hurs)	0	6	*Lima.*
Shale (Hog Calf)	1	6	*Dapedius.*
Limestone (Hog and Second Hog, sometimes including a shale of 2 inches)- -	0	8	*Psiloceras planorbe. Dapedius.*
Shale (Bottom-floor Calf)	0	6	
Limestone (Bottom floor)	0	6	*Dapedius* and various Fishes.
Shale (Good-for-nothing Calf)	1	0	Various Saurians, Fishes, and Invertebrates.
Limestone (Good for nothing)-	0	4	*Psiloceras planorbe*, abundant, and various Fishes.
Shale (Four-foot Calf)	2	6	Various Saurian remains and Fishes.
Limestone (Four foot)	1	0	*Psiloceras planorbe* commences.
Shale - -	Rhætic beds not worked.		
Limestone (Black Rummels) - -			
Shale - - -			
Limestone (White Hurs)			
Shale -			

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* Judd, *Geology of Rutland* (Survey Memoir), p. 45. Blake, *The Yorkshire Lias*, pp. 14, 16. *The Jurassic Rocks of Britain* (Survey Memoir), vol. i. p. 28, by C. Fox-Strangways ; vol. iii., p. 187, by H. B. Woodward.

† Compare section by Harrison, Geology of Leicestershire and Rutland, p. 37.

Beds of limestone and shale are frequently exposed along the stream course between Sileby and Seagrave, but the strata are so much disturbed along this valley that the general sequence of the rocks is not very clear; they appear, however, for the most part to belong to this zone. The limestones were worked in former times at Seagrave, but the pits have long been closed.

Along the valley of the Wreak they again come out in the small streams near Thrussington and Hoby, and a strong band of limestone, with *Am.* [*Psiloceras*] *planorbis*, is seen in the railway cutting just north of Rotherby. Mr. Judd mentions that traces of the Fish and Insect Limestones, lower part of the zone of *A. planorbis*, were found in the railway cutting at Kirby,* which seems to show that if the beds are not repeated by faults they must be lying nearly flat along this part of the valley. This section is now, unfortunately, entirely obscured; and, not knowing of the above observation at the time, there was considerable difficulty in arriving at a conclusion whether it was cut in solid strata at all.

South of this valley there are no sections in the Lias till we get to the stream flowing past Gaddesby, where the solid strata begin to emerge from beneath the Boulder-clay, and may be followed along the bottom of the branching valleys to the east. Sections are, however, not very good. The limestone bands were at one time worked at Ashby Folville, but the quarry is now full of water. From the spoil-heaps here we obtained *Lima gigantea* and a *Pseudomonotis*, the limestone beds containing a good deal of fossil wood. About half a mile above the village some impure limestone bands, with small cement nodules, and shales containing *Pecten Thiollieri* and *Gryphæa arcuata*, crop out in the stream.

At Twyford Lodge there is a small scar showing blue shale and limestone with *Lima pectinoides* and a small *Pecten*; while between the village and the railway viaduct there are several small sections in shales, from which were obtained *Am.* [*Ægoceras*] *brevispina*, *Belemnites* (fragment), *Pecten lunularis*, *Gryphæa cymbium*, *Arcomya sp.*, and close to the viaduct, *Am.* [*Ægoceras*] *Jamesoni*, *Belemnites acutus ?* (fragment), *Gryphæa cymbium*, *Gryphæa sp.*, and *Gresslya intermedia*, showing that here we are getting into higher zones.

In the next valley to the south, starting from Queniborough, we first observe Lower Lias beds about a mile east of the church, but nothing very definite is seen till we come to South Croxton. On the hill to the south-west of this village, about 300 yards from the fox-cover of Barkby Holt, there is an old pit which appears to have been worked for ironstone. This ironstone, we presume, is on the horizon of the *A. semicostatus* beds, which obtain some importance in the map to the north-east; but we were not able to obtain any evidence to verify the point. In the valley thin limestones and shales occur with *Gryphæa arcuata*, *Lima gigantea*, and a *Pinna*, so that these must be still in the *A. Bucklandi* beds.

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* *Geology of Rutland* (Survey Memoir), p. 58.

Further up the valley, nothing definite is seen till we get nearly to Loseby, and reach the higher zones of the Lower Lias.

In the valleys, which run down on either side of Ingarsby Station, Lias beds are frequently seen, but there are no sections that call for particular notice. About 500 yards north-east of the station there is a steep bank above the stream showing shales with nodules of whitish limestone containing *Rhynchonella tetrahedra* and a large *Pholadomya*; while a little further down, at the old brickyard, ironstone fragments are seen lying about, but the section here is now covered up. It is, however, very possible that this is about the horizon of the *A. semicostatus* beds. Following down the valley towards Beeby we pass over limestone bands with crinoids, and below the village reach shales with sandy bands containing *Gryphæa arcuata.*

In the valley to the south these beds are better seen, especially near Keyham, where we obtained *Am.* [*Ariet.*] *sauzeanus*, *Am.* [*Ariet.*] *semicostatus*, *Gryphæa arcuata*, and *Pecten* (fragment). At the viaduct near here there are some hard calcareous beds with *Am.* [*Aeg.*] *Bucklandi*, *Gryphæa arcuata*, *Lima gigantea* and many other fossils; so that it would appear that the higher ground about here is on the horizon of the *A. semicostatus* beds, while the valleys cut through into those of the *A. Bucklandi* zone. The lithological character of the beds is shown by the well at Ingarsby Station.* Further evidence of the *A. semicostatus* beds is given by the cuttings at the western end of the Ingarsby tunnel, where there is a considerable excavation in dark shales yielding—

Am. [*Arietites*] *Conybearei*, Sow.
,, [,,] *sauzeanus*, d'Orb.
,, [,,] *semicostatus*, Y. & B. Very abundant.
Belemnites (cylindrical form).
Amberleya Chapuisi, Terq.
Rhynchonella plicatissima, Quenst.
Gryphæa arcuata, Lam.
,, *cymbium*, Lam.
Modiola (fragment).
Serpula.

Along the railway between here and Thurnby there are several shallow cuttings in Lias shales, the spoil-heaps from which yielded to Mr. J. D. Paul, at the time the line was being made in 1882, the following list:—†

Ichthyosaurus (vertebræ).
Am. Bucklandi, Sow.
,, *Conybearei*, Sow.
,, *catenatus*, Sow. (one specimen only).
,, *obesulus*, Blake.
,, *sauzeanus*, d'Orb.
,, *semicostatus*, Y. & B.
Nautilus striatus, Sow.
Belemnites.
Eucyclus elegans, Münster.
,, *undulatus*, Phil.

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*Appendix, p. 88.

† *Trans. Leicester Lit. and Phil. Soc.*, 1883, p. 50.

Chemnitzia.
Gervillia ?
Gryphæa arcuata, Lam.
Lima gigantea, Sow.
„ *pectinoides*, Sow.
Ostrea liassica, Strickl.
Pecten æquivalvis, Sow.
„ *lunularis*, Roemer.
Plicatula spinosa, Sow. (*Harpax Parkinsoni*).
Cardinia Listeri, Sow.
„ *cardioides* [*? Unicardium*].
Gresslya lunulata ?, Tate.
Leda æquilatera ?, K. & D.
Modiola hillanoides, Chap. & Dew.
„ *scalprum*, Sow.
Rhynchonella plicatissima, Quenst.
Serpula.
Hemipedina (spines).
Pentacrinites.

These no doubt indicate the greater part of the *A. Bucklandi* zone, with their passage into the *A. semicostatus* beds above.

Further west, where the railway crosses the Uppingham Road, there is a cutting in brown and grey shales and limestone bands with *Lima gigantea*, *Gryphæa arcuata*, *Modiola minima*, and a *Nautilus*. Mr. Quilter records *Am. catenatus* from here. From the general position we should think that this cutting is just at the junction between the *A. Bucklandi* and *A. angulatus* beds. To the south of this, at Crown Hills and Evington, 189 feet of Lias were proved in the deep boring there, containing no less than thirty-four bands of limestone, although most of them were very thin. In the quarry near here a portion of these beds is exposed, from which Mr. Quilter records the following list:—

Ammonites Charmassei, d'Orb.
„ *scipionianus* ?, d'Orb.
Cryptœnia.
Gryphæa arcuata, Lam.
Lima gigantea, Sow.
Pecten lunularis, Roemer.
Cardinia Listeri ?, Sow.
Leda.
Modiola ?
Unicardium cardioides, Phil.
Rhynchonella plicatissima, Quenst.
Cidaris ?
Pentacrinus briareus, Miller.

This section is now much worn down, but Mr. Plant has preserved the record of it* and several other sections that were made by the Evington Coal Boring Company between the years 1876 and 1881.

In the valley south of Evington, and near Knighton, there are a few exposures of Lias beds, but nothing of any importance. In the field below Ashfield House a sinking of 40 feet is reported to have been in fossiliferous shales, which from its position probably reached the Rhætic beds; and a well in Stoneygate also appears to have been sunk to the same strata, but unfortunately the information is not very precise. More definite evidence of the base of the Lias was furnished in cutting the sewer that runs along the Knighton valley, which proved the *A. planorbis* beds at South Knighton, and entered the Rhætic beds, as we have noticed above, about 200 yards from Knighton Church. South of this some bands of white and buff flaggy limestone may be seen in the southern branch of the stream, and the wells at Wigston Fields appear to reach Rhætic beds at a very slight depth. In the railway cutting just beyond here we gather from Mr. Plant's MSS. that two or three beds of limestone were met with, but no fossils are recorded. The surface of the Lias appears to have been much disturbed by glacial action.

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* Appendix, p. 74.

In the clay-pit at Glen Parva Station the base of the Lias is seen resting on the Rhætic beds. There is here, as we have noticed, a band of limestone 2 feet 2 inches thick, which we take as the base of the Lower Lias. It contains the usual characteristic Lias fossils, while the shales below are very unfossiliferous. These lower beds outcrop under most of the town of South Wigston, but the only exposures about here have been in shales. Thin limestone bands were seen along the Midland Railway at Wigston Station, and near Kilby Bridge and a few other places; but the best section is in the large quarry at Kilby Bridge, where these beds are worked. There are said to be twenty-one bands of limestone in this quarry, but only seventeen are worked. The bands of limestone are separated by soft crumbly shale, and not by hard and firm shale (slavin), as at Barrow. Very few fossils are found here, except *Lima gigantea*, which is fairly abundant.

The two streams which unite at Great Glen afford a few exposures in Lias shales. At Little Stretton these contain *Gryphœa arcuata*; and in a clay-pit at the side of the Uppingham Road there is some grey clayey shale, with a band of small ironstone nodules, which Mr. Quilter has referred to the zone of *A. oxynotus*; but this pit is not worked now, and we could not find any fossils.

In the north-east corner of the area the Lower Lias is exposed over most of the low ground below Burrow and Little Dalby, but there are very few sections at the present time, except along the stream flowing north past Leesthorpe. A band of limestone, with *Terebratula punctata* and two small species of *Pecten*, much crushed, was also seen in the stream near the Grange, north of Little Dalby. A little to the south of this Professor Judd records* *Am. Jamesoni*, Sow., *Hippopodium ponderosum*, Sow., *Gryphœa obliquata*, Sow., *Gryphœa cymbium*, Lam. (*G. Maccullochi*, Sow.), *Avicula* sp., *Belemnites*, and joints of *Pentacrinus*, from the west side of Little Dalby; and on the other side of the hill, *Am. Maugenesti*, d'Orb., *Am. armatus*, Sow., *Belemnites* sp., *Gryphœa obliquata*, Sow., *Plicatula spinosa*, Sow.; and *Montlivaltia rugosa*, Wr.

Along the stream coming down from Ouston, and in the Marefield valley, there are many sections in the upper part of the Lower

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* *Geology of Rutland* (Geological Survey Memoir), p. 61.

Lias, but the clearest exposures are at Loseby, a little south of this. In the old brickyard here there is the following section:—

Section at Loseby Brickyard.

	Ft.	in.
Surface clay.		
6. Shales with ferruginous nodules, very few fossils	6	0
5. Obscured (? shale with *Ammonites*, &c.) -	8	0
4. Nodular band decomposed to yellow clay (Large septaria of Judd)	0	3
3. Shale, harder and more laminated	2	6
2. Hard calcareous band with *Pecten* (Indurated stone of Judd) -	1	0
1. Shale with small round nodules, *Gryphæa cymbium* -	2	0

From here we obtained *Am.* [*Ægoceras*] *armatus*, *Am.* [*Ægoceras*] *densinodus*, *Gryphæa cymbium*, and *Homomya*. This section was again visited at a later date by the writer, in company with Mr. Montagu Browne, when by the help of some small excavations a somewhat fuller list was obtained. These, through the courtesy of Mr. Browne, we are able to give below, with the addition of those previously recorded by Professor Judd.

Fossils from Loseby Brickyard.

	——	Judd.	1.	2.	3.	4.	5.	6.
	Saurian vertebræ - -	x	—	—	—	—	—	—
	Belemnites acutus, *Miller* - -	x	—	x	x	—	—	-
	Am. [Oxynoticeras] Coynarti, *d'Orb.*	x	—	—	—	—	—	—
	,, [Phylloceras] Loscombei, *Sow.*	x	—	—	—	—	—	—
	,, [Ægoceras] armatus, *Sow.*	x	—	—	—	—	—	—
N	,, [,,] subplanicosta, *Oppel* †	—	x	—	x	x	—	—
N	,, [,,] densinodus, *Quenst.*†	—	—	—	x	x	—	—
N	,, [Arietites] Macdonnelli, *Portlock* (Am. nodotianus, *Wr. non d'Orb.*)† -	—	—	x	—	—	—	—
N	,, [Psiloceras] aplanatus, *Hyatt* (Am. tardecrescens, *Blake non Hauer*) † - -	—	—		x	—	—	—
	Nautilus truncatus, *Sow.* -	x	—	—	—	—	—	—
	Actæonina sp.	—	—	x	—	—	—	—
	Cerithium sp. -	—	—	—	—	—	—	x
	Pholadomya ambigua, *Sow.*	x	—	x	x	—	—	—
	Panopæa elongata, *Roemer* -	x	—	—	—	—	—	—
	Unicardium cardioides, *Phil.*	—	—	x	—	—	—	-
	Gresslya (near to intermedia, *Simp.*) -	—	—	—	x	—	—	—
	Cardium truncatum, *Sow.* -	—	x	x	—	—	—	x
	,, sp.	—	x	—	—	—	—	—
	Hippopodium ponderosum, *Sow.*	x	—	x	—	—	-	—
N	Cardita multicostata, *Phil.* -	—	x	—	—	—	—	
	Cardinia Listeri, *Sow.* - -	—	x	—	—	—	—	—
	,, sp. - -	x	—	—	—	—	—	—
N	Arca Stricklandi, *Tate* (A. truncata, *Buckm.*) -	—	—	—	—	—		x
	,, sp. - -	—	—	—	—	—	—	x
	Modiola scalprum, *Sow.* -	x	—	x	—	—	—	—
	,, hillana, *Sow.* -	—	x	—	-	—	—	—

† Species marked thus have been determined by Mr. S. S. Buckman. Those marked N are new records from this locality. The figures in the last six columns refer to the strata in the section given above.

Fossils from Loseby Brickyard.–continued.

	——	Judd.	1.	2.	3.	4.	5.	6.
	Avicula sp.	x	–	–	–	–	–	–
N	Pecten Thiollieri ?, *Martin*	–	–	x	–	–	–	–
	„ textorius, *Schloth.*	–	x	x	–	–	–	–
	„ calvus, *Goldf.*	–	x	x	–	–	–	–
	„ sp.	–	–	x	–	–	–	–
	Limea acuticosta ?, *Münster*	–	x	–	x	–	–	–
	Lima pectinoides, *Sow.*	–	–	x	–	–	x	–
	„ gigantea, *Sow.*	–	–	x	–	–	–	–
	„ Hermanni, *Voltz.*	x	–	–	–	–	–	–
	„ sp.	–	–	x	–	–	–	–
	Plicatula sp.	–	–	x	–	–	–	–
	Gryphæa cymbium, *Lam.*	x	–	–	–	–	–	–
	„ obliquata, *Sow.*	x	–	–	–	–	–	–
	„ sp.	–	–	x	x	–	–	–
	Ostrea sp.	–	x	x	–	–	–	–
	Rhynchonella variabilis, *Schloth.*	–	x	–	–	–	–	–
	Ditrupa ? etalensis. *Piette*	–	x	–	–	–	–	–
N	Extracrinus sp.	–	–	–	x	–	–	–
	Pentacrinus sp.	x	–	–	–	–	–	–

In and near the railway there are several sections in the zones of *A. Jamesoni* and *A. capricornus*. From the deep cutting at Cold Newton we obtained *Am.* [*Ariet.*] *sauzeanus*, *Belemnites*, *Avicula*, *Lima pectinoides*, *Pleuromya costata*, *Plicatula spinosa* (abundant). *Terebratula* (fragment), *Serpula*, *Pentacrinus*; and in ditches near Hamner's Lodge *Am.* [*Aeg.*] *capricornus*, *Belemnites sp.*, *Eucyclus imbricatus*, *Plicatula spinosa*, and *Serpula*. At the station there is a hard band of limestone with *Rhynchonella tetrahedra*, *Cardinia sp.*, etc., which is probably very near the junction between the Lower and Middle Lias.

Some hard beds of limestone crop out in the little stream on the north side of Billesdon; and, where the lane to Billesdon Coplow crosses, ferruginous shale and hard bands are exposed containing *Pecten æquivalvis*, *Arca Stricklandi ?*, *Modiola scalprum*, *Rhynchonella lineata*, and *Belemnites*. These beds must be very near to the top of the Lower Lias, and possibly should be included in the Middle Lias, but without further evidence it is impossible to say.

In this neighbourhood two borings have been put down into the Lower Lias, which show the great thickness these beds attain here. The first, which was sunk about the year 1833 on the south side of the hill at Billesdon Coplow, was made in search of coal. This boring, it is evident both from the depth sank and from the character of the strata penetrated, did not reach the base of the Lias, although supposed to have been sunk in true Coal Measures. Professor Judd (*Geology of Rutland*, p. 62) gives the depth of this boring as more than 600 feet, but the account given by Holdsworth, of which we give an abstract in the appendix, does not allude to so great a depth as this.* Another boring was put down in 1897 close to the Billesdon Brook, three-quarters of a mile south-west of the village. This proved over 700 feet of Lias beds, and, as it commenced beneath the outcrop of the Middle Lias, the full thickness of the Lower Lias cannot be much short of 750 feet.

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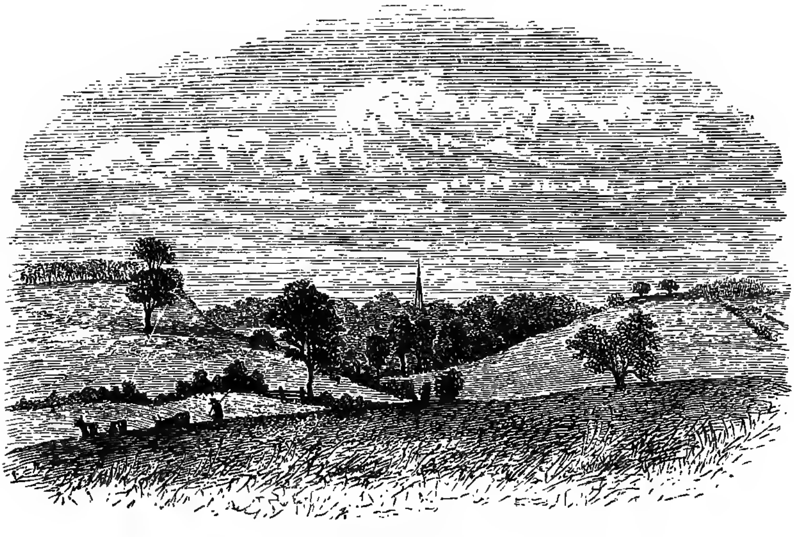
* See p. 88. This is the boring to which the anecdote of Professor Sedgwick related by Professor Jukes (*Life and Letters of J. B. Jukes*, 1871, p. 467, quoted by Harrison, *Geology of Leicestershire*, p. 3) is supposed to refer.

South of Billesdon the Lower Lias is brought up by a fault, so that its outcrop is shifted some distance further east. It crops out in the valleys to the south of Rolleston, and was met with in a well at Illston Hall, which is said to have been sunk 110 feet in grey shale with much selenite and pyrites. Dark shales were also thrown out of a well at Three Gates, but no fossils could be found to fix the horizon of the beds.

In the stream due east of Rolleston dark and grey shales with nodules containing *Am.* [*Aeg.*] *capricornus* were found, and a little lower down there are several sections in shales with ironstone nodules, showing that this valley is cut down into the upper part of the Lower Lias. The valleys further east—that is, the Eye Brook and the numerous small streams uniting at Hallaton—do not appear to have cut through the *A. margaritatus* shales of the Middle Lias. Prof. Judd * suggests that the *A. capricornus* beds may have been reached at the bottom of the clay-pit at Hallaton brickyard, but as the Rock-bed crops out at the road, there is not sufficient room for the full thickness of the *A. margaritatus* zone.

Middle Lias.

FIG. 4—*Village of Somerby, Rutland, situated at the head of one of the deep sinuous valleys of the great escarpment formed by the Marlstone Rock-bed.* (*F. Rutley.*)†



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* *Loc. cit.*, p. 62.

† From *Geology of Rutland*, p, 53.

*Fossils from the Old Whissendine Brickyard at Rocott.**

Ammonites margaritatus, De Mont. Normal form; specimens very numerous, often of large size and great beauty.
Belemnites paxillosus ? Schloth. Very large.
Pecten sublævis, Phil.
Cardium truncatum, Sow.
Lima pectinoides, Sow.
Modiola scalprum, Sow. Very abundant and large specimens.
Myacites (*Pleuromya*) *unioides*, Röm., sp.
Terebratula punctata, Sow.
Rhynchonella tetrahedra, Sow.
Serpula sp.

At Pickwell the Middle Lias gets clear of the Drift, and the Rock-bed forms the marked tabular feature which is so characteristic of the rock. This table-land, which is bounded by a bold escarpment on the north and west, dips gently to the east; it extends as far as Somerby on the south and Burrow Hill on the west, where it attains a height of 689 feet above the sea, forming one of the most conspicuous landmarks of the district. The *A. margaritatus* shales crop out on the steep slopes below, both to the north and west, and in the deep ramifying valleys on either side of Somerby. They were also met with in a well at Burrow on the Hill.

Between Somerby and Ouston the outcrop is masked by Drift, and the rock is seen only at a few places; the most important exposure being at the old brickyard about half-way between the two villages, where the *A. margaritatus* beds have been worked a short distance below the outcrop of the Rock-bed. Of this section, which is now entirely obliterated, Professor Judd gives the following account:—

Section at Ouston Brickyard.

		Ft.	in.
1.	Soil.		
2.	Light-coloured clay only partially exposed.		
3.	Band of ironstone	0	6
4.	Blue, highly micaceous and pyritous clay	3 0 to 4	0
5.	Blue, sandy, calcareous and highly micaceous rock, crowded in places with fossils -	2	0
6.	Clay similar to 4, but with bands of septaria -	21	0 to bottom of the pit.

The fossils were beautifully preserved and are enumerated in the following list:—

Fossils from the Middle Lias Clays of Ouston Brickyard.

Ammonites margaritatus, De Mont., typical form, very abundant; many of the specimens attaining a great size.
Ammonites normanianus, d'Orb.
Belemnites elongatus, Mill.
Belemnites sp.
Helicina expansa, Sow. sp.
Ostrea sp.
Pecten æquivalvis, Phil.
,, *sublævis*, Phil.
Avicula inæquivalvis, Sow.

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* Rocart on the old one-inch map.

Mytilus hippocampus, Y. & B.
„ *scalprum*, Sow. Very variable in form; very abundant.
Cardium truncatum, Sow
Pleuromya unioides, Roemer., sp.
Pholadomya decorata, Hartm.
„ *ambigua*, Sow., var. ?.
Serpula sp.
Pentacrinus sp.

In the neighbourhood of the railway at Tilton the Middle Lias again becomes clear of Drift, and forms a series of bold headlands, which may be easily followed as far as Billesdon. At Life Hill, near Billesdon Coplow, where the outcrop extends furthest to the west, the Rock-bed rises to an elevation of 700 feet above the sea. At the foot of this the sandy shales of the *A. margaritatus* beds crop out. They consist of blue and yellow shales, with ironstone nodules and hard calcareous bands. These beds are found in the steep slope immediately below the escarpment of the Rock-bed, and rarely extend for any great distance beyond it. They may be followed from the Tilton cutting to Loseby Station, where they form the rising ground immediately to the south. It is doubtful whether a portion of the beds seen in the cutting here should not also be included in this zone.

Around Billesdon Coplow these beds form a rather more extensive outcrop, being seen in the lane going down to Ingarsby, and, in two or three shallow excavations west of the house. From a well near the farm, which was 47 feet deep, we obtained *Am.* [*Lytoceras*] *cornucopia*, *Pecten æquivalvis*, and *Arca Stricklandi* ?. The old boring here is also just within the outcrop of these beds, which it must have penetrated for a few feet.*

In the lane leading to Billesdon, close to the bridge, there is as we have noticed, a hard band of blue limestone with *Arca Stricklandi* (?), *Modiola scalprum*, *Rhynchonella lineata*, *Belemnites*, etc.; and some yellow sandy shales with ironstone nodules containing *Pecten æquivalvis* are seen a little further up the valley which, although probably representing the upper part of the *A. capricornus* beds, cannot be far from the base of the *A. margaritatus* zone.

In the brickyard at Billesdon is the most complete section we have of these beds. In 1890 the following details were measured here:—

Section in Brickyard at Billesdon.

	Ft.	in.
Dark, red, ferruginous, sandy limestone - - -	2	0
Grey marly beds, changing to ferruginous sandstone	5	0
Yellowish sand beds - -	3	0
Hard, greyish shaly beds - - -	2	0
Break in measurements.)		
Grey shale - - - - - -	3	0
Ferruginous band with white efflorescence	–	–

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* Appendix, p. 88.

	Ft.	in.
Grey shale	4	0
Ferruginous band with large *Pecten æquivalvis*, etc.	—	—
Grey shale	4	0
Nodular band	—	—
Grey shale	2	0
Nodular band	—	—
Grey shale	5	0

About 15 feet more of shale with nodular bands are seen in the lower pit on the south side of the road.

Professor Judd, who saw this section many years before, gives a rather different account. It appears that this pit has been both deepened and cut further back in the interval, so that it now reaches the base of the Rock-bed, and there must be nearly 50 feet of measures exposed in the two pits. Fossils are not very plentiful, but Professor Judd records the following:—*

Fossils from the Billesdon Brickyard.

Ammonites margaritatus, Montf.
Belemnites paxillosus, Schloth.
Lima pectinoides, Sow.
Pecten æquivalvis, Sow. (*P. sublævis*, Y. & B.).
Plicatula spinosa, Sow.
Modiola scalprum, Sow.
Goniomya sp.

South of Billesdon the outcrop of the Middle Lias becomes much obscured, partly from the overlap of the Boulder-clay and other Drift deposits, but principally, we think, from the thinning out of the Rock-bed, which scarcely makes any feature in this country. Between Billesdon and the Ashlands there is no evidence for the outcrop of the Middle Lias, but from the general structure of the country it is probable that it forms the backbone of this ridge; although the beds seen at Illston and Rolleston may be outliers, and not connected with the main mass, as shown on the map.

The *A. margaritatus* beds are seen at Ashlands and Illston; in the road north-west of the latter village the following section was seen, but from the weathering down of the beds the account is very imperfect:—

Section in road on west side of Illston.

		Ft.	in.
Ferruginous clays with a little ironstone		10	0 (?)
Obscured		10	0 (?)
Very ferruginous rock	0 1 to	0	2
Yellow clays Greyish shale with carbonaceous markings		10	0
Flaggy sandstone	2 0 to	3	0
Grey and yellow shales, more ferruginous		5	0 or more

At the top of the hill, and in the pond at the north end of the village, ferruginous sandstone and ironstone are seen, forming the lowest portion of the Rock-bed.

Another isolated section of these beds is found in the little valley above Rolleston Wood, where the Rock-bed forms a small feature round the head of the valley. It consists of a thin bed of ferruginous limestone, with *Belemnites, Protocardium truncatum*, and other fossils. The blue sandy shales of the *A. margaritatus* beds were met with in the gasometer at Noseley Hall; but the Middle Lias about here is entirely covered by Drift, and there is no evidence to show how far it may extend to the south.

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* *Loc. cit.*, p. 69.

On the opposite side of the valley at Goadby the Middle Lias is free of Drift, and the Rock-bed forms a very marked feature. The rock is, however, very thin, so that it seems to be its unusually hard flaggy nature that enables it to form so regular a plateau. The outcrop is lost beneath the Drift about half a mile further south, but is seen to the east near the higher part of the interior valley going down from Keythorpe Wood, a little north of the footpath between Goadby and Hallaton. It is evident that the beds in this valley are lower than has been supposed, and that the outcrop of the Rock-bed does not run in the direct manner shown on the old map, but more probably extends much further to the west, in the direction of Staunton Wood, following the present contour of the ground much more nearly than was shown on the old survey.

The Rock-bed in this direction is evidently very thin, as shown by sections at Cranhoe and other places just beyond the edge of the map.

Since the previous survey of this country was published, the railway cutting through Slawston Hill, south of Hallaton, has been made. As this section gives a good idea of the character of the Middle Lias in the neighbourhood we give it here.

Section in Railway Cutting at Slawston Hill.

	Ft.	in.
*Massive sandy ironstone	3 or more	0
Sandy shales	4	0
Hard flaggy band	0	6
Sandy shales - about	12	0
*Dense red ironstone with *Belemnites* (many split longitudinally)	1	0
Sandy shales - about	7	0
* { Ironstone, shaly and nodular, with *Belemnites*	0	8
{ Band of ironstone, weathers with a very irregular surface	0	6
Shale with a nodule or two	3	8
Line of nodules some distance apart.		
Shale with a few nodules	5	0
Hard flaggy calcareous band - 0 0 to	0	4
Shale with nodules	15	0

Base of cutting.

The Goadby plateau extends across by Old Keythorpe into the valley going down to Hallaton. The Rock-bed can be seen at intervals on both sides of this stream, but it is evidently very thin.

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* These three beds stand out conspicuously from the grass slope of the cutting. The above details were measured in 1890, when the section had become much obscured. A somewhat different account, given by Mr. J. Marriott, is published in abstract in *Trans. Leicester Lit. Phil. Soc.*, 1884, p. 80.

It is 3 feet thick at Old Keythorpe; but a little lower down, where the bridle-road crosses the valley, the following section, which is now entirely obscured, was given by Professor Judd :—

UPPER LIAS :—

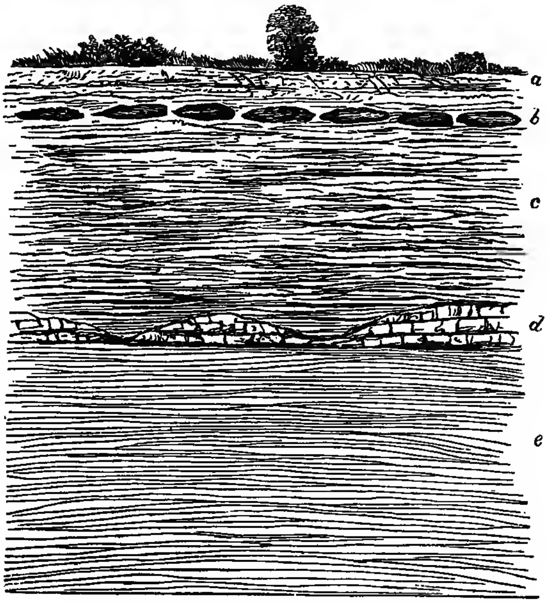
1. Laminated shales with traces of the "fish and insect beds" at the top - - 5 to 6 feet.

MIDDLE LIAS :—

2 Marlstone Rock-bed with usual characters, containing numerous *Belemnites*, *Ammonites annulatus*, *Terebratula punctata*, etc. As is often the case with this rock, it here contains numerous rounded pebbles and concretions 1 foot seen.
3. Light blue clays passing down into—
4. Clays with bands and layers of nodules of ferruginous and micaceous rock.

The irregular mode of occurrence of the diminutive representative of the Marlstone Rock-bed is illustrated in the following sketch of a section seen at this point :—

FIG. 5.—*Section exhibited in a pit between Keythorpe and Hallaton (Prof. J. W. Judd).*[*]



a. Soil, etc.
Upper Lias.
b. Nodular Fish and Insect Limestones.
c. Clays.
Middle Lias.
d. Marlstone Rock-bed.
e. Clays, etc.

The Rock-bed, although so thin, can be easily followed on both sides of the stream for its whole length down to the village. The outcrop is in some places obscured by landslips, and there are several springs that deposit large quantities of tufa. *Am.* [*Amaltheus*] *margaritatus* was found in the ferruginous beds just at the junction of the Rock-bed with the shales below.

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[*] *Geology of Rutland*, p. 73.

In the other valleys radiating from Hallaton the Rock-bed also forms a marked feature; it is cut into by the railway, which shows, at about 400 yards south of the tunnel, a limestone crowded with Brachiopoda, and which is about 1 foot 6 inches thick. All these valleys are cut for some depth into the *A. margaritatus* shales, but the only clear section is that at Hallaton brickyard, where the following section was measured:—

Section at Hallaton Brick Works.

	Ft.	in.
Yellow and grey shales with nodules	5	6
Rubbly ironstone with *Terebratula*, etc.	1	6
Shale	1	0
Rubbly ironstone	1	6
Shale - - - -	3	0 seen.

Professor Judd records the following fossils from this place:—

Ammonites margaritatus, Mont.
Avicula inæquivalvis, Sow.
,, sp.
Pecten liasianus, Nyst.
,, sp.
Cardium truncatum, Sow.

These shales with ironstone nodules were also obtained from a well at Horninghold, but we were not able to find any fossils in them. At this last village the Rock-bed is seen along the sides of the stream and in the road; it is a brown sandy rock, with a little flaggy limestone, and contains, according to Professor Judd *Am. annulatus* and *Rhynchonella tetrahedra*.

The remaining exposures of the Middle Lias are in the three inlying valleys to the north, the Eye Brook, the River Chater, and the River Gwash. In the first of these valleys the Rock-bed is best seen at East Norton and at Loddington; but further up the valley to the west it is soon lost beneath Drift, so that the extent of the outcrop is very doubtful. It probably occurs along the higher part of Reddish Wood, and runs against the fault a little to the west of this, but there is no evidence of the rock beyond Loddington Mill. The same obscurity occurs on the south side of the valley, no rock being seen between Tugby and the little valley just south of Skeffington, where a ferruginous rock containing *Terebratula punctata* crops out. This ground is represented on the old map (64) as Lower Lias, but the section at Skeffington was not observed; and as the hill rises gradually from one village to the other it is much more probable that the outcrop of the Rock-bed is continuous.

The *A. margaritatus* shales crop out along the Eye Brook, but whether this valley is cut through to the Lower Lias is doubtful.

From the septaria in these shales at the Belton old brickyard Professor Judd obtained the following fossils :—

Ammonites margaritatus, Mont. Several varieties, and of all sizes.
Pleurotomaria Quenstedti, Goldf.
Myacites or *Panopœa* (fine specimen).
Leda complanata, Phil.
Cardium truncatum, Sow. (in masses).
Pecten demissus, Phil.
,, *œquivalvis*, Sow.
Lima pectinoides, Sow.
,, sp.
Plicatula spinosa, Sow.
Avicula inœquivalvis, Sow.
Rhynchonella tetrahedra, Sow. (one specimen).

Along the valley of the Chater the Rock-bed and the shales just below are very well exposed. Sanvey Castle, at the head of the valley, is formed almost entirely by the Rock-bed, which here stands up in an abrupt little cliff of well-bedded sandy limestone, full of Brachiopoda in the lower part, resting on softer sandy ferruginous beds; while a little lower down the stream the grey shales below with septaria are seen. There are 6 inches of rotten sandstone with ferruginous nodules at the junction. The rock has been quarried at Withcote, Launde, Coles Lodge, and Leighfield; it contains *Rhynchonella tetrahedra*, *Terebratula punctata* in great abundance, and also a *Cardinia*. When freshly quarried the limestone is bluehearted.

In the valley of the River Gwash the Rock-bed first comes to the surface at the point where the streams branch about three-quarters of a mile below Knossington; it forms a fairly good feature along the north side of the valley all the way to Braunston, where it is exposed in the village. On the south side of the valley, however, the outcrop is very obscure, and it is possible that it may be cut out by a fault ranging along the valley. The shale is much disturbed at several places, and it is curious that, although the outcrop is so good on the north side of the valley, the rock has not been observed on the south side; but the evidence is scarcely sufficient to warrant the insertion of a fault along this valley.

The rock is not now used as an ironstone anywhere in the area included in this map; it was at one time tried near Tilton, but apparently without much success.

Upper Lias.

The Upper Lias occupies the whole of the remaining part of the map to the east of the Middle Lias escarpment, except in those valleys that are cut through to this latter formation. Consequently all the ridges between these valleys are formed of Upper Lias shale, which is, however, generally covered in the higher part by Drift. These shales form large swelling pastures, and it is seldom that there are any sections to show their character. Formerly there were a few brickyards in them; but now, owing to the depression in agriculture, very few artificial sections for drainage or other purposes are made, and the brickyard at Knob Hill, east of Hallaton, is the only place where these shales are worked.* Therefore we have to gather our information of the Upper Lias principally from the old Survey memoir on the district, which was undertaken between the years 1867 and 1871, when the country was more prosperous, and consequently exposures of the shales much more frequent. Professor Judd divides the Upper Lias into the following five divisions† :—

e. "*Leda-ovum Beds.*" Clays with numerous bands of septaria (many fossils).
d. Highly pyritous clays, with much jet in places (few fossils).
c. "*Communis Beds.*" Laminated blue clays with bands containing numerous small fossils.
b. "*Serpentinus Beds.*" Clays with nodules of limestone, sometimes ferruginous (Ammonites abundant).
a. "*Paper-shales with Fish and Insect Limestones.*" ("Dumbleton series.")

The thickness of the Upper Lias is given by Professor Judd as about 200 feet, but it is not quite so much as this near its western edge. Below the outliers of Oolite at Ranksborough and Whatborough there is not more than from 110 to 120 feet, but below Robin-a-Tiptoes and at Belton there is as much as 180 feet or so.

At Knob Hill the finely-laminated shales, which contain crystals of selenite often 6 inches or more in length, are very unfossiliferous; and only a few decomposed bivalves were noticed in them. The only other section near here was in the bottom of a pond in the valley to the north, where there are some soft ferruginous beds with oolitic grains containing *Am.* [*Coeloceras*] *communis.* Professor Judd, in his account of this country, says‡—"On the left bank of the stream at Hallaton Ferns the junction of the Upper and Middle Lias was well seen in a number of field-drains. The succession of beds here is as follows :—

Upper Lias	1. Dark blue clays.
	2. Ferruginous beds with *Ammonites serpentinus*, Rein. (abundant), and *Am. bifrons*, Brug.
	3. Paper-shales, with Fish and Insect Limestones (usual fossils.)
Middle Lias	4. Sandy, ferruginous band with casts of shells. (Marlstone Rock-bed ?)
	5. Light-coloured clays with ironstone balls.

"Near the bridle road from Keythorpe to Hallaton, at the point where it crosses the brook, some old pits show the base of the Upper Lias, consisting of 5 or 6 feet of laminated shales, with traces of the nodular limestones, with fish and insect remains; these rest upon the Middle Lias beds, which have been already described at this place. (See page 73).

"Opposite to Moor Hill Lodge there is an extensive brickyard in the Upper Lias Clays. In this and a pond above we have a section of at least 50 or 60 feet of the series. The highest beds seen consist of laminated, light-coloured clays, with irregular, brown, ferruginous bands in the lines of stratification. The lower part consists of blue clays with few septaria, but with much pyrites, both in nodules and disseminated through the mass, and, in consequence, the weathered beds exhibit much Selenite, often in very large and beautiful crystals. Fragments of *Belemnites* occur in this pit, and *Ammonites* are also found, but I saw none sufficiently well preserved for identification. The clays exposed in this pit probably belong to the middle portion of the Upper Lias, which is generally very unfossiliferous. In Keythorpe Park a pond, dug in the lower part of the Lias Clays, exhibited the richly fossiliferous bands crowded with small *Ammonites*, etc., which characterise that part of the series. I collected here—

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* There were also formerly brickyards in these shales at Launde and Moorhill.

† Memoirs of the Geological Survey. *Geology of Rutland,* p, 79.

‡ *Loc. cit.*, p. 83.

Ammonites communis, Sow. (Very abundant.)
„ *annulatus*, Sow. (Very abundant.)
„ *Holandrei*, d'Orb.
„ *radians*, Rein. (Abundant.)
„ *bifrons*, Brug.
Belemnites compressus, Voltz.
Leda ovum, Sow. sp.
Inoceramus dubius, Sow.
etc., etc.

" The brickyard opened on the opposite side of the road to Tugby Hall exhibits the same beds, consisting of finely-laminated blue clays with a few septaria. These clays when dug show a few small crystals of Selenite. The beds are crowded with small fossils of the same species with those found at the last noticed locality.

" At several points about the village of East Norton, and also at Finchley Bridge, roadside cuttings and field-drains have exposed the fish and insect beds with the usual fossils. Small bivalves, such as *Inoceramus dubius*, Sow., and *Pectens* with dwarfed *Ammonites* occur in some of the bands of flattened limestone nodules.

" An interesting pit at Allexton exhibits the following section of the lower beds of the Upper Lias:—

	Ft.	in.
1. Soil - - - - -	1	0
2. Blue laminated clay - - - -	6	0
3. Irregular stony band (" kale ") full of *Ammonites serpentinus*, Rein., *Belemnites* and other fossils	1 to 2	0
4. Laminated clay - -	0	6
5. First, irregular bed of hard, argillaceous limestone -	0	6
6. Laminated clay - - - -	1	0
7. Second, irregular bed of hard argillaceous limestone	0	6
8. Laminated clay -	1	0
9. Third, or best bed of limestone 0 3 to	0	6
10. Laminated clay -	0	4½
11. " Kale " -	0	6
12. Marlstone Rock-bed full of the usual fossils ; four course of stone - - - - - - together	2	6

" In the clays large masses of wood, converted into jet, are found These, after being soaked in oil to prevent cracking, are used by the workmen and others for whetting razors.

"The three layers of limestone contain the usual fragments of fish, insects, and crustaceans with the following shells :—

Belemnites sp.
Ammonites serpentinus, Rein.
" *elegans*, Sow.
" *annulatus*, Sow.
" sp.
Small univalves.
Ostrea (small species).
Inoceramus dubius, Sow.
Astarte sp.
Lima sp.
Pteroperna sp.
Other small bivalves.
Fragments of wood.

"The limestone, which is hard and fissile, and of a blue colour weathering white, occurring sometimes in continuous bands and at other times in nodules, is carried to Tugby, where it is burnt for lime. It is said to produce a hydraulic lime fully equal in quality to the celebrated "Barrow lime," which is made from the fish and insect limestones of the Lower Lias series.

"It is worthy of notice that the Serpentinus bed, which in many places is ferruginous, and has often, when attention has not been given to the fossils, been mistaken for the Marlstone Rock-bed, is at Allexton either not at all or only very slightly coloured with oxide of iron.

"At Deepdale traces of the fish and insect limestones of the Upper Lias are seen lying on the Marlstone. At several points about Loddington there are small exposures in the road-cuttings of the same beds."*

Along the railway north of Loddington there are some deep cuttings of about 40 feet or so in these shales, which, although now grassed over, afforded many fragments of *Am.* [*Harpoceras*] *falcifer* and other species.

A well near the Windmill at Billesdon was sunk in the lower part of the Upper Lias, the spoil-heap containing several specimens of *Am.* [*Harpoceras*] *falcifer* together with a *Nautilus*, and many fragments of the fish and insect limestone. In the road on the north side of Tilton on the Hill, and at Pickwell, Professor Judd records the presence of the fish and insect limestones, but these sections were not visible at the time of the present survey.

To the east of Somerby the Upper Lias is very free of Drift, and may be easily recognised from the nature of the soil; but there are no excavations in the beds, although a brickyard, now closed, was formerly worked about a mile from the village. There are also two small outliers between Somerby and Burrow Hill. To the north of Pickwell and Rocott the Upper Lias becomes entirely covered by Drift, and there is no evidence to fix how far it may extend in the direction of Whissendine.

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* *Loc. cit.*, pp. 83, 84.

CHAPTER V.

INFERIOR OOLITE.

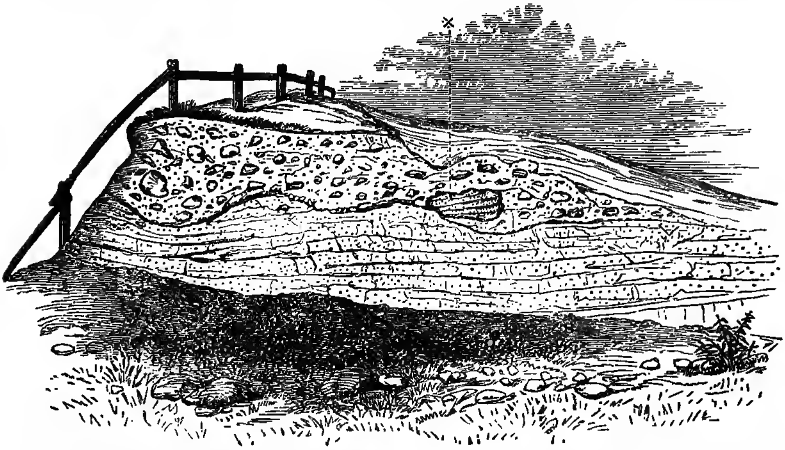
Northampton Sand.

The beds of the Inferior Oolite that are represented in this map are quite at the base of the formation, and merely represent a few scattered fragments that have so far resisted denudation. They are the equivalent of the Northampton Sand, which in some localities is very variable in character; but here, owing to the small thickness of rock that remains, and therefore to its greater exposure to the weather, very little calcareous matter is left, and we have a residue consisting almost entirely of soft ferruginous sandstone. This sandstone has a peculiar "cellular" structure, consisting of a casing of brown hæmatite enclosing a soft interior of blue and green carbonate and silicate of iron, or merely ferruginous sand. This structure, which is well shown at Launde Park Wood and other places, seems to be caused by the concentration of hydrated peroxide of iron along the bedding planes and joints that have split up the rock into roughly rectangular blocks.

The main escarpment of the Inferior Oolite lies between three and four miles beyond the eastern margin of the area now under consideration: therefore there are only a few small outliers of the rock that come within this area.

The first of these occurs to the north of Hallaton, but it is almost completely covered by Drift, so that the rock is only seen along its northern and western edge. The following sketch at this place is from the old Survey memoir:—

Fig. 6.—*Section in pit above Hallaton Ferns, showing a small outlying patch of Northampton Sand capped by Boulder-clay. (Prof. J. W. Judd.)*†



* Large boulder, 18 inches long, of the hard siliceous limestone (Pendle) of the Inferior (Lincolnshire) Oolite.

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† *Geology of Rutland*, p. 107.

It is probable that the rock also occurs on the hills east of Hallaton and south of Allexton, where fragments of the Inferior Oolite are very conspicuous and the elevation sufficient to bring on this rock; but as the ground is entirely covered by Drift it has not been shown on the map at these places.

The largest outlier is that to the north-east of Belton, but only a very small portion comes into this map. It may, however, extend further along the ridge to the west, and be connected with that south of Launde Park Wood, the ground being sufficiently elevated but entirely covered by Drift. The western edge of this latter outlier is much depressed by a fault, so that it and the small outliers just north of Loddington are quite 50 feet lower. There is another small outlier at Launde Big Wood; but, both from their isolation and greater elevation, the most noted outliers are those at Robin-a-Tiptoes and Whatborough. These hills rise above the 700 contour line and form very conspicuous objects in the landscape. Colborough Hill also assumes the aspect of an Oolitic outlier, and it is probable that the rock is only just removed by denudation, as a careful examination of the hill revealed nothing but shale close to the summit.

Although it is possible that the Inferior Oolite may occur on the hills on either side of the Gwash and at Cold Overton, there is no evidence of its outcrop this side of Ranksborough Hill. Here two very small outliers occur, the ground between being only just denuded below the base of the rock. This hill has steep sloping banks of Upper Lias Clay on the west and south, but towards the north Drift clay soon comes on, and therefore it is not so conspicuous when viewed from the latter direction.

The beds of the Northampton Sand form a light rubbly soil, well adapted for the growth of corn; but the areas covered by the rock in this district are so small that the only place where its presence has any influence on agriculture is on the flat-topped hill east of Belton.

CHAPTER VI.

PLEISTOCENE AND RECENT.

Glacial.

The superficial deposits which come into this map are of considerable interest from the fact that they illustrate the character of these beds in one important branch of the great Trent basin. The nature of the Pleistocene succession in this large area has been ably described by Mr. R. M. Deeley,* who separated these beds into no less than eight sub-divisions in the following order :—

Newer Pleistocene Epoch.

Later Pennine Boulder-clay.
Interglacial River-gravel.

Middle Pleistocene Epoch.

Chalky Gravel.
Great Chalky Boulder-clay.
Melton Sand.

Older Pleistocene Epoch.

Middle Pennine Boulder-clay.
Quartzose Sand.
Early Pennine Boulder-clay.

Mr. Deeley drew his conclusions from a large number of isolated sections; but the detailed mapping of the ground does not entirely substantiate these ideas.

As yet the survey of this midland district has not been carried far enough to give a decided opinion on the subject, so that the classification adopted in this memoir relates only to the Soar valley, and may be subject to modification when a larger area has been examined. Many of the differences noted in the Boulder-clay and gravel appear to be due to merely local conditions, and it is probable that some deposits of slightly different character are really contemporaneous. The main fact drawn out from a study of the Drifts is that they are of two distinct ages; the one having its included fragments, consisting principally of quartzite pebbles derived from the west or north; the other, containing detritus of the Chalk and Oolite, from the east. These, as we have said, occupy the relatively higher ground throughout the district. There is also possibly a third series of clays and gravels which were laid down at a much later date, after the existing valleys had been cut out, and consequently it is only found at the lower levels. This is so intimately connected with the post-Glacial

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**Quart. Journ. Geol. Soc.*, vol. xlii., p. 437.

river beds, that probably it should be included with them. It may represent a passage of from one state of conditions to the other. With the exception of these doubtful beds, the general distribution of the Drift is that of one vast sheet rising gradually to the watershed and falling equally gradually on the other side. This sheet, which seldom has a thickness of more than 100 feet, is cut through by all the principal streams of the districts, so that the solid strata are exposed in nearly all the valleys, while the Drift is found capping all the ridges between them.

The following appears to be the order of succession of these beds in this district:—

Valley Drift.
Great Chalky Boulder-clay with intercalated beds of sand and gravel.
Older Boulder-clay (upper part).
Quartzose Sand.
Older Boulder-clay (lower part).
Older Sand and Gravel. (?)

Older Sand and Gravel.—Along the valley of the Wreak, fringing the modern alluvium of that river, there are a series of sands and gravels, the age of which is somewhat puzzling. At first sight these appear to be ordinary post-Glacial river terraces, and no doubt a good deal of the gravel along this valley is of this nature; but at the same time there are places where the gravel appears to pass under the older Boulder-clay, and consequently must be the oldest of the superficial beds with which we have to deal.

This appears to be the case more especially at Eye Kettleby, east of Kirby, at Rotherby, and at Rearsby, on the south side of the Wreak. On the north side the gravels at Hoby and Asfordby are probably also of this age, but the evidence is more indistinct. These beds consist of false-bedded sands and gravels, composed chiefly of quartzite pebbles and other rocks derived from the north and west, with few, if any, from the Chalk or Oolite. The sands generally contain streaks of coaly fragments, with intercalated clayey patches here and there. They rise usually from the level of the alluvium to from 30 to 40 feet above it, flanking the meadows on either side in the ordinary manner of river terraces, so that it is very difficult to distinguish one from the other. These gravels may be of pre-Glacial age in part, and, if so, it clearly shows that the present valley is excavated nearly in the same line as the old one.

The principal evidence for the position of these sands and gravels is chiefly in that part of the Wreak valley that is north of the present area, more especially at Eye Kettleby, Frisby, and Hoby. In this area they are seen at Rearsby, and apparently crop out along the valley towards Frisby Lodge, but their position is obscure.

The Older Boulder-clay.—The principal section of this Boulder-clay is in the brickyard at Thrussington, although it is also seen along the valley to the north, and in that to the north-east of Seagrave. It consists of a stiff marly clay of a variegated red and bluish-grey colour, with small pebbles of quartzite and other rocks, but containing few, if any, large boulders, nor any derived from the Chalk or Oolite. For this reason it appears to be the result of a glaciation derived entirely from the west, and thus is in strong contrast to the Boulder-clay containing Chalk and Oolite, which has come from the opposite direction. It however contains a considerable amount of limestone derived from the Lias, which is usually well striated, as also are most of the harder rocks.

The Quartzose Sand.—This name has been given by Mr. Deeley to the coarse sand lying on the Boulder-clay just described. It principally occurs along the sides of the larger valleys, and consists principally of false-bedded sand and gravel, the sand frequently containing great quantities of coal detritus.

This sand, being much used for building, is extensively worked near Leicester, both at Aylestone and near the Abbey.* At the latter place portions of the sand are frequently cemented together, so that the floor of the pit is a very hard sandstone, and there are pillars of the same kind of rock. The isolated block of stone known as St. John's Stone, which formerly stood near this place, was probably, as pointed out by Mr. J. D. Paul, a pillar of this sort.†

Similar cemented gravels are frequently met with at the base of the Drift, one very conspicuous instance being in the railway cutting near Rowley Fields. The long tunnel between Glenfield and Leicester is entirely cut in these sands, which are here full of water, so that if a hole is made in the brickwork it requires considerable force to close it again. Similar gravels occur at Oadly and other places.

This sand is seen resting on the Boulder-clay at Thrussington brickyard. It passes up into a laminated clay or brickearth which attains its greatest thickness and best development in the valley of the Wreak at Rotherby and to the north of Hoby.

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* This pit is now closed.

† *Trans. Leicester Lit. Phil. Soc.*, vol. iii., part v., p. 262.

In the brickyard at Rotherby, where these clays were formerly worked, they are about 26 feet thick, and pass down into a hard tough red Boulder-clay. The following is the section:—

Section in Rotherby Brickyard.

	Ft.	in.
Loamy soil, with Chalk fragments.		
Boulder-clay, containing mostly Lias fragments and quartzite pebbles, but with one or two Chalk fragments - - -	8 0 to 12	0
Stratified clayey sand with coaly matter and a few pebbles. Thin seam of clay in upper part - -	4 9 to 5	0
Laminated brick-clay or sandy loam of a reddish colour, with a pebble here and there (lower part proved by boring) - - - -	21	0
Hard, tough, red Boulder-clay, with small quartzite pebbles and a few bits of limestone, etc. (bored into)	12	0

This brick-clay has a red Keuper-looking appearance, as if it had been deposited from tranquil water largely charged with the débris of that formation. It is usually underlaid and overlaid by sand, and frequently passes altogether into sand or gravel; so that the colour shown on the map denotes in some places a loamy clay, in others a sand or gravel. It appears, however, to be only on the outskirts of the area over which the brick-earth has been deposited, or among beds which occupy the same horizon—namely, between the Boulder-clay just described and the one above—that we find these coarser sands.

The area over which the brick-clay has been deposited is about five miles across in either direction, and consequently covers about 25 square miles, of which the village of Hoby is nearly in the centre. Beyond this lenticular patches of sand and gravel occur at the same horizon throughout other portions of the district. These in many places contain a large proportion of Chalk débris, in others there is not a Chalk fragment to be found; so that, although they seem to have been deposited at about the same time, they are probably the result of conflicting currents at the period when the country was passing from the glaciation which produced the older Boulder-clay to that which formed that next to be described. Whether they are all of this date is, however, doubtful.

A similar brick-clay occurs at Melton, which has been described by Professor Judd, who considers it to be of pre-Glacial age.*

These sands and gravels occasionally join on to those previously described beneath the Boulder-clay, so that without clear sections it is impossible to distinguish one from the other: for this reason the colours used for Drift on the map indicate merely lithological differences without regard to their relative age.

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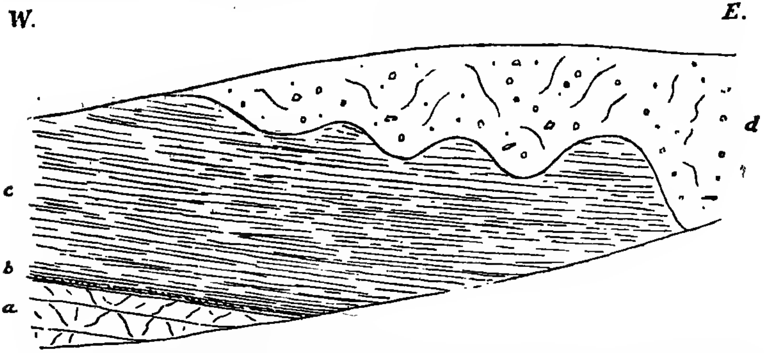
* Geology of Rutland, p. 243.

The Older Boulder-clay (*upper part*).—Resting on these sands and laminated clays there is another Boulder-clay similar to that described above, in that it does not contain any fragments of Chalk or Oolite. This Boulder-clay rarely exhibits any trace of stratification, but near the base is frequently intersected by numerous striated surfaces or slickensides, which give the clay an irregular, jointed appearance. This was well shown in the section on Spinney Hills.

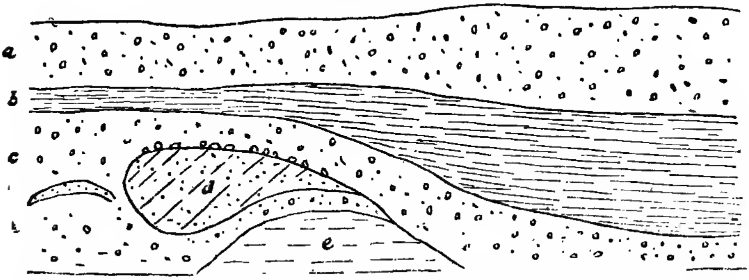
FIG. 7.—*Section on the west side of Spinney Hills, Leicester.*



d. Boulder-clay resting on distinctly glaciated surface with striations. The Boulder-clay, which is much slickensided, contains mostly Lias fragments, a few quartz pebbles, limestone fragments (striated) and one large sandstone block.
c. Dark laminated shale with selenite crystals and much sulphur. Yellowish rusty-looking band at intervals, and occasionally jetty-looking streaks. Small *Protocardium philippianum* and *Avicula contorta.* Dip 3° E. Limestone nodules at east end.
b. Bone bed, varying in thickness from half an inch to nothing.
a. Tea-green or grey marl.

A good instance of the great irregularity in Drift deposits of this age is shown in the following section :—

FIG. 8.—*Section on the Midland Railway, just south of the tunnel, Freeman's Common, Leicester.*



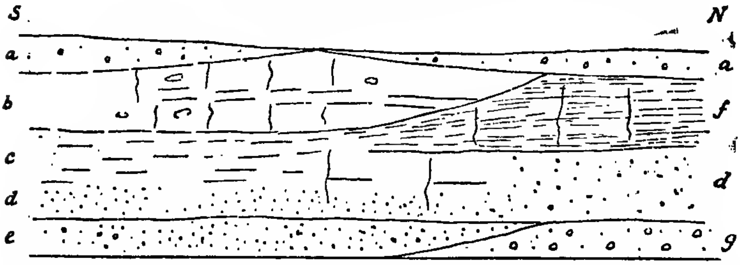
a. Boulder-clay with but few stones of any size, a few Chalk fragments and flints.
b. Laminated clay with a few very small stones ; 6 to 8 feet thick in thickest part.
c. Boulder-clay, a line of pebbles as large as the fist resting on (*d*).
d. Sand with much coaly matter, stratification highly inclined.
e. Keuper Marl with a little white sandstone.
Height of section about 15 feet, more Boulder-clay above.

This Boulder-clay, which probably covers a large area, comes to the surface only on the flanks of the hills bordering the Soar and its tributaries, being nearly everywhere else hidden by newer beds, to be described presently. Its chief outcrop is along the spurs of the hills east of the Soar; but it does not appear to extend much north of Seagrave, as it is not traceable in the upper part of any of these valleys, nor was it met with in a well at the Lodge a mile north-west of Seagrave, which went through the overlying Boulder-clay directly into the Lias. Towards the east its outcrop also gradually becomes more and more obscure, so that probably in this direction it also soon thins out.

The outcrop of this Boulder-clay frequently forms a distinct feature which is easy to recognise in walking over the ground; but, as there would be much uncertainty in attempting to trace it continuously, it has not been separated on the map from the overlying Chalky Boulder-clay.

The Chalky Boulder-clay.—The Chalky Boulder-clay covers the whole of the higher ground between the numerous streams intersecting the district, except at a few places in the eastern part. It appears to attain its greatest development in the northern portion of the map, gradually diminishing in thickness towards the S.E.* It consists when unweathered of a darkish blue or grey clay, with fragments of chalk, flint, and other rocks; but on exposure to the air it becomes decalcified and of a reddish-brown earthy nature. The amount of included fragments varies considerably in different places, sometimes there is a clay with very few stones, at others the deposit is almost entirely made up of chalk and chalk flints with very little clay. The other rocks, which include sandstones, limestones, slates, quartzites, igneous rocks, etc., from various formations, are always in a distinct minority, being probably derived from older glacial beds, and not from the original glaciation of the country where they have their outcrop. An interesting section in the lower part of the Drift was seen in one of the cuttings of the Great Central Railway.

FIG. 9.—*Cutting on Great Central Railway, south-east of Stocking Farm, Leicester.*



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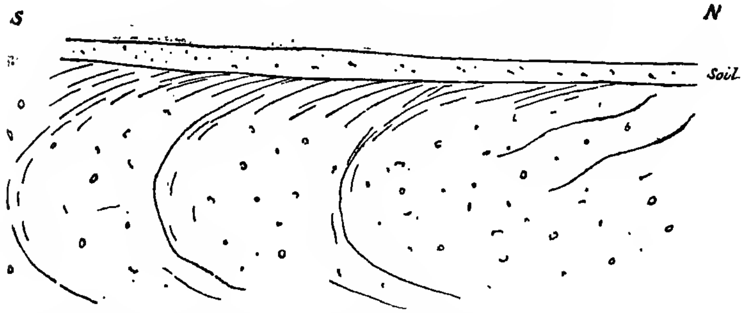
* A well about a mile west of Hallaton is said to have been sunk to a depth of 150 feet. The spoil-heap consisted of Boulder-clay only.

a. Weathered Boulder-clay with scattered chalk flints - at N. end	4	0
b Irregular, lumpy, soft, marly, sandy beds, and clay with incipient concretions - - -	6	0
c. Sand and loam with marly partings containing "race" - -	5	0
d Loamy sand - at N. end	3	0
e. Chalk gravel	2	0
f. Stiff drab clay -	3	0
g. Gravelly, chalky Boulder-clay	3	0

(*b*) is very similar to unconsolidated Coal-measure clay.
(*c*) passes into dark brickearth in the centre of the section, and drab clay (*f*) towards the north.
The connection between the north and south ends of the section is not very clear.

Further evidence that the Boulder-clay has been subjected to subsequent movements after its deposition was shown at Enderby, where its upper portion has been bent over in the manner shown in the sketch given below. This curving over is towards the north, or from the summit of the hill, and may have been caused by accumulations of Drift slipping over that below.

FIG. 10.—*Section in cutting west of Enderby Hill.*



The Boulder-clay contains mostly Chalk fragments, few sandstones, etc., and very few pebbles. It is bent over towards the north-west, or from the hill. The curved lines are streaks of sandy loam or clay. At the end of the cutting the Boulder-clay abuts against the rock at an angle of 30°. It is rather gravelly close to the junction. Height of section about 16 feet.

Intimately associated with this Boulder-clay are several lenticular patches of sand and gravel. Some of these, as we have mentioned, were deposited previously to the Chalky Boulder-clay; but others are of later age, and are intercalated in its mass or deposited over it. They are very well developed at Tilton, Skeffington, Cold Overton, Knossington, Ouston, Belton, and many other places. They are composed almost entirely of Chalk, Oolite, and Lias fragments, and are frequently very much disturbed and contorted by great lateral pressure, as shown in the accompanying sketch by Professor Judd.

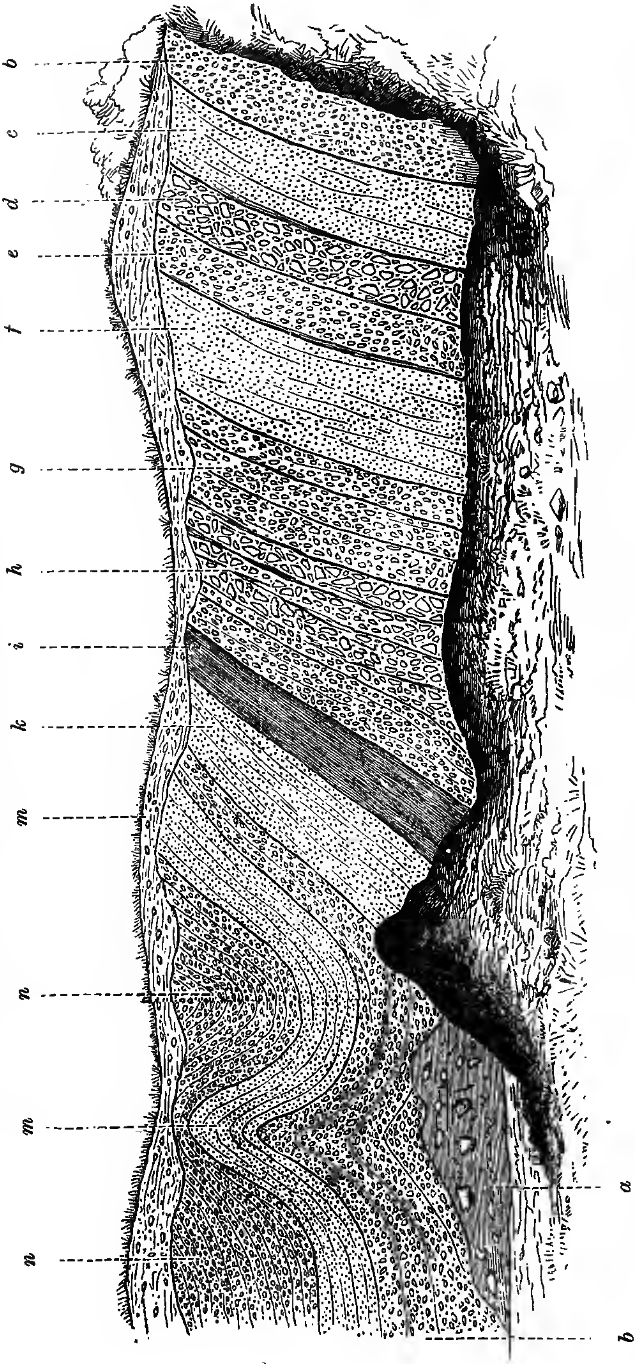


FIG. 11.—*Pit in Glacial Gravels between Whatborough and Ouston (Prof. J. W. Judd).**

a. Boulder-clay. *b, e, g, l, n*. Fine gravel. *c, f, k, m*. Sands. *d, h*. Coarse gravel. *i*. Loam.

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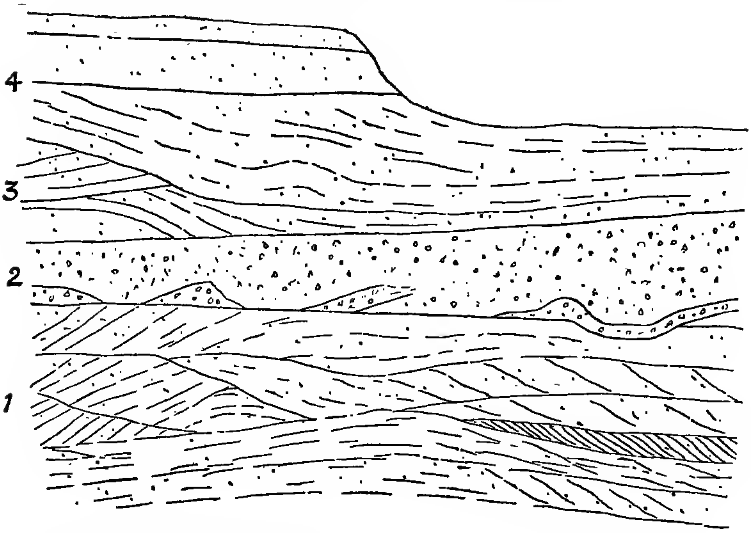
* Geology of Rutland, p. 248.

Another good section in these gravels was seen on the north side of the river at Blaby, of which we give the following rough sketch :—

FIG. 12.—*Sand Pit near Union Inn, Blaby.*

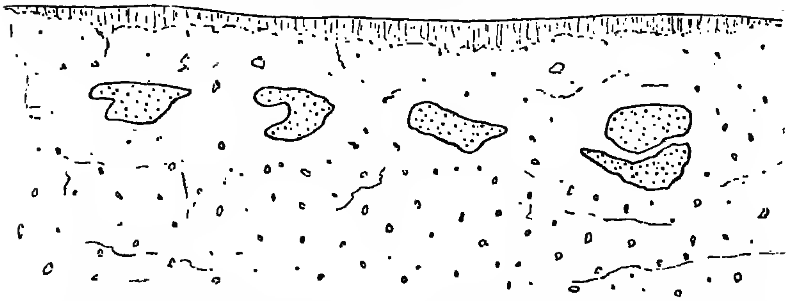


4.	Sand and gravel mixed.		
3.	False-bedded sand	15	0
2.	Chalky gravel with patches of Boulder-clay at the base		
1.	False-bedded sand- -	10	0

A few granite boulders lying about.

Other instances of this contortion of the Drift have been noticed at Tilton Windmill, in the railway cutting near Marefield, and in the railway cutting south of Wigston, where the sands are thrust in under beds of Lias.

FIG. 13.—*Balls of sand in Boulder-clay, corner of Ratcliffe Road and Elms Road, Leicester.*



Excavation about 10 feet deep. The balls of sand are about two feet in diameter. The Boulder-clay is grey or mottled with fragments of soft sandstone and Lias limestone abundant. A good number of quartzite pebbles, but no Chalk or Flint. Weathered clay with a few stones on top.

In the upper part of the Boulder-clay, as shown in the above figure, there are frequently curious lenticular patches of sand, that seem to run at one definite horizon, which is usually not many feet below the surface of the ground. It is not very clear how these pockets of sand have originated, whether they have been washed into hollows in the Boulder-clay, or whether they were deposited as frozen masses.*

The Drift rises to 730 feet on Life Hill, north of Billesdon, which is the highest ground in the map, so that there is no evidence as to what its maximum elevation may have been; but probably it was not much greater than this, as on the Charnwood Hills the Drift never rises quite to this level. It descends towards many of the existing valleys, showing that the present lines of drainage nearly coincide with those in pre-Glacial times. In a few cases, as at Illston Grange, north of Rolleston, and north-east of Ouston Woods, the Boulder-clay has not been cut through by the present streams, but this is very exceptional, and we have found no evidence of a pre-Glacial drainage system differing from the present one. The absence of Drift along the escarpment of the Middle Lias is probably due to the greater force of denudation along this steep bank; but why it has been cleared off the three channels running east from Burrow Hill to Ranksborough, from Tilton to Belton, and from Goadby to Horninghold is not so clear.

The Drift occasionally contains enormous transported masses of Oolite, Chalk, and Marlstone, such as have been noticed in the country to the north-east in the neighbourhood of Corby,† to the south at Rugby,‡ and elsewhere. One of these transported masses occurs just beyond the N.E. corner of this map. It is a mass of Oolitic limestone; and, as far as can be made out from old quarries, and the fragments lying about, appears to be at least 300 yards long and 100 yards across. The nearest point from which this mass can have come is at Waltham, about five miles to the north-east. At about 1,000 yards north-east of Belton there are two small rounded hills that appear to be capped by Inferior Oolite. These possibly are also drifted masses; but, as their summits are 80 feet below the outcrop of the rock, which is only 300 yards distant, they may be due to landslips. As has been stated in the memoirs descriptive of this neighbourhood (Sheets 64 and 70), it is probable that such masses are the result of coast ice acting along the Oolite shore at a period when the country was partially submerged.

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* Mr. Paul has noted similar occurrences at other places in the neighbourhood. *Trans. Leicester Lit. Phil. Soc.*, 1885, p. 117.

† Memoirs of the Geological Survey. Explanation of Sheet 70, p. 79.

‡ *Quart. Journ. Geol. Soc.*, vol. xxxi., p. 355.

In connection with this subject, it is interesting to note the general disposition of the larger boulders in this part of the country. The following list has therefore been compiled from the reports of the British Association, with a few additions from other sources:—*

LIST OF THE MORE REMARKABLE BOULDERS RECORDED IN LEICESTERSHIRE.

Square brackets denote additions or alterations.

Locality.	Dimensions.		Character of Rock.	Reference to Authority.
	Maximum.	Minimum.		
Hugglescote	10 tons	Gravel	All Charnwood rocks except one Millstone Grit.	Brit. Assoc. Rep., 1873, p. 190.
Shakerstone	5·0×4·0×1·6	—	Porphyroid and other rocks of Charnwood.	" " 1875, p. 88.
Carlton	—	—	Charnwood rocks	" " 1880, p. 113.
Market Bosworth	4·0×3·0×2·0	—	Syenite and ashy conglomerate of Charnwood.	" " 1880, p. 113.
[Leicester Forest]	6·0×4·0×4·6	Several smaller	Syenite	" " 1883, p. 142.
Kirby Muxloe	4·0×4·0×5·0	2·0×2·0×1·0	"	" " 1883, p. 142.
Loughborough?	8·0×3·0×2·0	—	Millstone Grit	" " 1883, p. 141.
Normanton-on-Soar.	—	—	Charnwood Forest rocks	" " 1875, p. 88.
Burton-on-the-Wolds.	3·6×3·4×5·0	—	Grit.	
Stanton, Notts	4·6×2·0×1·0	—	Lias [limestone], Quartzite, Millstone Grit, Carboniferous limestone.	" " 1875, p. 87.
Grimston	3·0×2·0×3·0	—	Jurassic limestone	Geological Survey.
	5·0×3·0×2·6	—	Coarse sandstone	" "
Saxelby	4·0×3·1×1·6	—	Jurassic limestone	" "
Kirby Bellars	3·0×2·0×1·6	—	Grit	" "
Hoby	3·0×3·0×3·0	—	Millstone Grit.?	Brit. Assoc. Rep., 1875, p. 88.
			Black basalt.	
Loseby	4·6×3·0×3·6	—	Granite, also flints and Quartzite pebbles.	" " 1877, p. 89.
	5·3×3·5×2·4	—	Millstone Grit	" " 1878, p. 190.
Syston, New York Farm "Moody Bush Stone."	[3·3×1·6×1·0]	—	Coarse, ashy conglomerate from Charnwood.†	" " 1880, p. 112.
[Syston?] Lodge Farm.	2·6×2·0×1·6	1ft. cube	Granite of Mount Sorrel	" " 1880, p. 114.
Rothley Temple	3·0×2·6×2·0	2·6×2·0×2·0	" "	" " 1881, p. 206.
Cropston	8·0×4·0	—	" "	Geological Survey.
Ingarsby Tunnel	3·6×2·6×2·0	—	Coarse carb. sandstone	" "
Bushby	2·0×1·9×1·4	1·6×1·3×1·3	Carb. limestone, Millstone Grit, &c.	Brit. Assoc. Rep., 1880, p. 112.
Thurnby	2·0×1·6×1·6	9in. cube	Granite, Syenite, Greenstone	" " 1877, p. 89.
	4·0×3·0×1·0	—	Granite	" " 1880, p. 111.
	6·0×2·0×1·6	1ft. cube	Carb. limestone, Millstone Grit	" " 1882, p. 246.
Johnstone's Farm.	5·0×4·0×2·0	—	Conglomerate or Breccia	" " 1880, p. 112.
Evington	3·0×2·3×1·6	1ft. cube	Granite, Millstone Grit, Limestone, Chert, Sandstone, &c.	" " 1877, p. 89.
Coleman Road	3·3×3·0×2·6	1·3×1·0×1·0	Sandstone, Grit, Limestone from the N.W.	" " 1878, p. 191.
Spinney Hill Road.	3·0×1·0×1·0	2·6×1·2×1·4	Granite of Mount Sorrel	" " 1878, p. 192.
Lodge Farm	4·6×2·6×1·0	3·0×2·6×1·0	" "	" " 1881, p. 205.
Leicester	—	—	Dark, slaty, hornblendic rock	" " 1874, p. 197.
	7·0×6·0×2·0	—	Granite of Mount Sorrel	" " 1880, p. 113.
Rutland Street	4·0×2·0×3·0	—	" "	" " " "
	8·0×1·10×1·3	—	" "	" " " "
Near the Abbey‡ "St. John's Stone"	7 feet above ground.	—	Sandstone.†	" " 1874, p. 197.
Abbey meadow	2·0×2·0×2·0	—	Chert from Derbyshire?	" " 1880, p. 114.
	2·0×2·0×1·0	1·6×1·0×1·0	Granite	" " 1881, p. 206.
North of Humberstone, "Holystone," or "Hellstone"	8·0×7·0×5·0 [8·0×7·10×3·6]	—	Granite of Mount Sorrel (longest axis 10ft., weight about 20 tons).†	" " 1874, p. 197. 1878, p. 190; 1881, p. 207.
Victoria Road	2·9×2·1×0·10	1·8×1·6×1·0	Granite, Syenite, Carboniferous limestone, Chert, Millstone Grit, Oolite.	Brit. Assoc. Rep., 1878, p. 193; 1880, p. 113; 1886, p. 223.

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* Since this memoir has been in the press Mr. Browne has published a list of boulders from the Beaumont Leys Estate. *Trans. Leicester Lit. Phil. Soc.* 1902, p. 34.

† The microscopical character of these rocks is given in the Appendix, p. 116.

‡ Probably not a boulder. *See* p. 45.

Locality.	Dimensions.		Character of Rock.	Reference to Authority.
	Maximum.	Minimum.		
Victoria Park -	1·6×1·0×1·0	10in. cube -	Granite, Syenite, Slate, Grit, Sandstone, Coal, Carboniferous limestone, Oolite, Lias, Chalk flints.	Brit. Assoc. Rep., 1881. p. 206.
Evington Road	3·1×2·1×0·10	1·5×1·2×1·1	Syenite, Millstone Grit, Oolite	„ „ 1878, p. 192.
Saxe Coburg Street.	3·3×2·2×2·0	2·6×2·0×1·10	Granite of Mount Sorrel - -	„ „ 1878, p. 192.
	3·0×2·6×1·10	—	„ „ - -	„ „ 1883, p. 141.
Clarendon Park	2·6×1·5×1·7	1·5×1·9×0·10	„ „ - -	„ „ 1878, p. 193.
	5·0×4·6×3·9	4·0×3·1×2·3	„ „ - -	„ „ 1881, p. 205.
	3·6×2·0×1·6	—	Syenite - - - - -	„ „ 1882, p. 245.
	2·6×2·0×2·0	1·6×1·6×1·0	Lias, Syenite, Granite, Greenstone, Millstone Grit.	„ „ 1882, p. 245.
Oadby - - -	2·0×1·0×2·0	1·6×1·0×1·0	Granite of Mount Sorrel - -	„ „ 1880, p. 114.
Stoughton, Dairy Farm.	4·0×3·0×2·6	—	„ „ - -	„ „ 1881, p. 205.
Spinney Hills, Lodge Farm.	3·0×2·6×1·9	2·0×1·0×1·0	Granite and Millstone Grit -	„ „ 1881, p. 206.
Spinney Hills -	3·3×3·0×2·6	—	Granite, Grit and Oolite - -	„ „ 1888, p. 123.
Willow Brook -	3·0×2·0×2·0	2·0×2·0×1·3	Granite, Grit and Slate of Charnwood.	„ „ 1881, p. 206.
Saffron Lane -	4·0×3·6×2·0	1ft. cube -	Granite, Basalt, Syenite - -	„ „ 1882, p. 246.
Newfoundpool -	6·0×3·0×2·6	—	Syenite - - - -	„ „ 1888, p. 123.
Braunston - -	3·0×2·6	—	Sandstone - -	Geological Survey.
Knighton Church Lane.	3·0×2·0	—	Syenite -	Leicester Lit. Phil. Soc., iii., p. 207.
Aylestone -	3·0×2·10×2·10	2·0×1·0×0·10	„ -	Brit. Assoc. Rep., 1878, p. 191.
	2·6×2·0×1·10	1·0×0·10×0·9	„ - - -	„ „ „ „
	7·0×6·0×4·0	—	Granite of Mount Sorrel - -	„ „ 1882, p. 245; Leicester Lit. Phil. Soc., 1882, p. 23.
	4·0×3·6×3·0	—	Syenite† -	Brit. Assoc. Rep., 1880, p. 111.
	3·0×2·10×2·8	—	„ -	„ „ 1880, p. 114.
	4·0×3·0×1·6	—	„ -	„ „ 1881, p. 206.
	6·0×3·6×3·0	4·0×3·0×3·0	„ - - - -	„ „ 1882, p. 246.
Beasley's Farm	3·0×1·9×1·3	1·9×1·3×0·10	Millstone Grit, Triassic sandstone.	„ „ 1882, p. 246.
Beasley's Pit -	4·6×3·3×1·6	—	Millstone Grit - - - -	Leicester Lit. Phil. Soc., 1883, p. 24.
Aylestone Road -	4 9×2·0×2·3	—	Syenite - - - - - -	Leicester Lit. Phil. Soc., iii., p. 208.
Hallaton - -	7·0×6·0×3·0	—	Marlstone - - - - -	Brit. Assoc. Rep., 1883, p. 141.
Conntesthorpe -	2·6×2·0	—	Keuper sandstone, Oolite, Greenstone, Quartz.	„ „ 1880, p. 113.
Ashby Magna Station.	12·0×12·0	—	Marlstone - - -	Geological Survey.

Valley Drift.—Besides the two Boulder-clays described above there is a later deposit which we have called the Valley Drift, from its occurring along the lower ground, and in the bottoms of valleys which have been denuded since the older glacial beds were formed. This Drift occurs along the small tributary valleys about Barrow and Sileby, and seems to be occasionally present beneath the river gravels, but no clear sections have been seen in this area. It is never of any great thickness, usually not more than about five feet or so, and appears to be largely made up of pre-existing Boulder-clays. It contains irregular lenticular patches of sand and gravel, which appear to have been thrust into the mass of the clay; but the most noteworthy fact in connection with this glaciation is that the upper portion of the Lias strata, on which it reposes, is nearly always more or less disturbed, and frequently violently contorted, with patches of gravel thrust into it for some depth. A good section of this was shown in the limestone quarry about a mile N.E. of Barrow Church, a diagram of which is given below.

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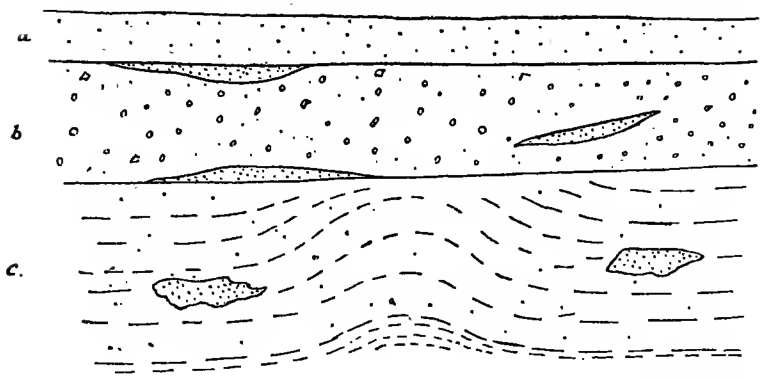
† The microscopical character of these boulders is given in the Appendix, p. 116.

FIG. 14.—*Section in upper part of limestone quarry ("Darby's Pit") north-east of Barrow.*



	Ft.	in.
a. Soil cap with Chalk fragments, etc. - about	1	0
b. Boulder-clay with Chalk fragments and pebbles, and streaks of sandy gravel. Majority of stones are Chalk - - -	4	0
c. Lias clay with specks of calcareous matter and bits of limestone; also patches of sandy chalk gravel here and there - -	2	0
Lias shales and limestones below		

It is very evident that a different state of things existed at the time of the formation of this Drift to that which obtained during the deposition of the two earlier Boulder-clays. The small thickness of this clay, the limited area over which it extends, and the disturbed stratification both of it and of the beds upon which it rests, seem to point to the conclusion that the climate must have been considerably milder, and the ice of a more local character, than that which prevailed during the two preceding periods of glaciation. We would, therefore, suggest that this newer deposit may be the result of a purely local glaciation which operated for a much shorter period, and during which the present valleys were occupied by glaciers or floating ice emanating from the central region of Charnwood.*

Sand and Gravel.—Besides the sands and gravels which are associated with the two earlier Boulder-clays there is a third series of these beds, which appears to have been deposited during this later period, although the age of these sands is always much more difficult to determine than that of the clay.

As shown in the section at the top of the Barrow lime-pit (Fig. 14), both the Drift-clay and the upper part of the Lias contain frequent pockets of sand. These may, in other places, spread out into thicker beds of sand and gravel, but they are not distinctive enough to be shown on the map.

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* My colleague, Mr. H. B. Woodward, who accompanied me on one occasion to this pit, expressed his opinion that the glaciation belonged to the period of the Chalky Boulder-clay.

These sands and gravels, like the clay itself, are never found much above the bottoms of the present valleys; and for this reason are not easily distinguished from the post-Glacial valley gravels.

River Gravels and Alluvium.

Along the valleys of the Soar and Wreak there are well-marked terraces of river gravel flanking the modern alluvium of these rivers. These are about 20 feet above the present river flat; and, near the confluence of the two rivers at Syston, form considerable spreads of flat gravelly soil. They have evidently been deposited at a time when the rivers flowed at a higher level, and when there was a greater volume of water than at the present time. These terraces in many places extend up the lateral valleys, and in their upper part join on to the alluvium of those streams so that it is difficult to separate one from the other. This is the case at Leicester, where, the old town being built on one of these terraces, its later extension has obliterated all trace either of its connection with earlier valley deposits or with the alluvium of the Willow Brook, with which it becomes merged in the northern part of the town. Besides the modern alluvium of the main streams there are frequently deposits of loam which have generally been ignored, but in a few places have been included with the alluvium. This loam masks the outcrop of the later Drift beds, so that without sections it could not be mapped. A great number of mammalian remains have been found from time to time in the newer deposits near Leicester, of which the following species are recorded by Mr. Montagu Browne.

List of Vertebrate Remains found in Leicestershire, recorded by Montagu Browne ("The Vertebrate Animals of Leicestershire and Rutland," 1889).

PLEISTOCENE.

Species.	Localities.
Bison *bonasus*, var. *priscus*, Bojanus	Abbey Meadow, Archdeacon Lane, and Kegworth.
Bos *taurus*, var. *primigenius*, Bojanus	Abbey Meadow, Belgrave (?), Willow Bridge, West Langton.
Cervus *elaphus*, Linnæus	Abbey Meadow, North Bridge, and Barrow-on-Soar.
Elephas *antiquus*, Falconer	Barrow-on-Soar and Thorpe Arnold.
Elephas *primigenius*, Blumenbach	Valley of the Soar, Abbey Meadow, Belgrave, Humberstone, Thurmaston, Loughborough, Kegworth, and Melton Mowbray.
Rangifer *tarandus*, Linnæus	Grafton Place, Abbey Meadow, Belgrave, Aylestone.
Rhinoceros *leptorhinus?*, Owen	Belgrave, Thurmaston.

PREHISTORIC AND RECENT

Species.	Localities.
Bos *taurus*, var. *longifrons.* Owen	Abbey Meadow, Flood Works, Thurnby, Syston, Barrow-on-Soar, Loughborough.
Capra or *Ovis* -	Leicester, Syston, and Barrow-on-Soar.
Capreolus *caprea*, Grey *	
Cervus *dama*, Linnæus	Town Hall Lane and Flood Works.
Cervus *elaphus*, Linnæus	Abbey Meadow, North Bridge, and Barrow-on-Soar.
Equus *caballus*, Linnæus - -	Braunston Gate, Fosse Road, Belgrave, Birstal, Mountsorrel, Barrow-on-Soar, Loughborough, Kegworth.
Sus *scrofa*, Linnæus - -	St. Nicholas Church, Friar Lane, Abbey Street, Bede House Meadows.

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* Recorded in error by J. Plant, *Leicester Lit. and Phil. Soc.*, 1874, p. 37. See Browne, L. Vert, p. 34.

CHAPTER VII.

FAULTS.

The solid strata in this district are, on the whole, nearly flat, with a slight dip towards the east; and, although the beds seen in the streams are frequently much disturbed, there do not appear to be many large faults. Owing to the covering of Boulder-clay there are probably more of these dislocations than are shown on the map, but they cannot cause any great displacement in the strata.

Barrow and Sileby Fault.

The principal evidence for this fault is between Barrow and Sileby, beyond the northern edge of the map, where it cuts out the Rhætic beds bringing in the Keuper Marl against the Lower Lias. At Sileby the effect of the fault is very striking from the close proximity of these strata, both at the back of the village and in the stream. Further east the exact position is not so clear; but it is evident that it must either turn more to the north-east or be met by another fault to the north of Ratcliffe R. C. College where the well was sunk in Keuper Marl without meeting with any Lias or Rhætic beds. From the exposure of Keuper Marl in the valleys on either side of Thrussington it is clear that the fault extends to the north of these sections, and is probably continued some distance up the Wreak valley. Although the exact position of the fault cannot be determined, owing to the covering of Boulder-clay, its general effect is very apparent, by the setting back of the Rhætic and Lias outcrop, and by the occurrence of the basement beds of the Lias at Kirby Bellars, far to the east of their normal position.

Billesdon Fault.

On the south side of Billesdon the Middle Lias, which forms so grand an escarpment to the north of the village, is cut off by an east and west fault. The strata that are brought up to the south are, however, so much hidden by Drift that it is not possible to estimate the amount of displacement, but the recent survey of the ground about Rolleston and Skeffington seems to indicate that it is not nearly so large as has been supposed. In Sheet 64 of the old Geological Survey this fault is continued to the north of Skeffington and Loddington, but there is so much Drift over the high ground east of Billesdon that, although this may be the same as the fault next to be described, it is better to treat them separately.

Loddington Fault.

The principal evidence for this fault is in the two streams coming down from Robin-a-Tiptoes, where the sandy beds of the Middle Lias are brought against the Lower Lias shales. At Loddington the effect of the displacement is to bring the base of the Inferior Oolite rather nearer to the Rock-bed of the Middle Lias than it usually is. The amount of throw is, however, small and a sharp roll of the strata would nearly produce the same effect. To the east of this the fault appears to soon die out.

The other faults that have been noticed are only quite small, although they cause a marked breach in the continuity of the strata. In a little valley north of Humberstone the Rhætic beds are seen in the stream on the south side of a fault running north-west and south-east, while on the north the Keuper Marl nearly caps the hill on the same line of strike. The throw may be from 30 feet to 40 feet.

On the north side of Burrow Hill there is a sharp drop in the base line of the Rock-bed, and the plateau formed by this rock is perceptibly higher to the north, towards Little Dalby, than what it is at the encampment.

South of Somerby there is another small fault that also throws down the Rock-bed to the south. The effect of this dislocation is very apparent on the roads to Ouston and to Knossington from the clear features formed by the Rock-bed, which is 30 feet or so higher to the north than what it is on the south side of the valley. This fault is probably continued some distance to the west, for in the valley on the east of Burrow the escarpment of the Rock-bed drops very rapidly to the south, falling as much as 100 feet in 400 yards. This seems to be the result of a sudden bending down of the strata on the line of fault rather than an absolute dislocation.

It is possible that there is a fault along the south side of the Gwash valley, but the evidence is not sufficient to warrant the structure being so mapped. On the north side of this valley the Rock-bed is fairly well exposed and makes a good feature; but on the south side the position of its supposed outcrop is entirely covered by Boulder-clay, either in place or in slipped masses. The stream, moreover, exhibits many sections in vertical or highly inclined strata, so that there is great probability of there being a disturbance of some sort along the valley. Possibly further evidence on the point may be forthcoming when the country to the east is surveyed.

APPENDIX I.

BORINGS AND WELL SECTIONS.

Leicester.

WILLOW BROOK BORING.

On the estate of the Rev. F. G. Burnaby, at the foot of Spinney Hills, near where Green Lane crosses the brook. From Mr. Plant's MSS. :—

		Thickness.		Depth.	
		Ft.	in.	Ft.	in.
1	Marl	40	0	—	
2	Gypsum and grey skerry	11	0	51	0
3	Marl	9	0	60	0
4	Gypsum	1	0	61	0
5	Marl	2	0	63	0
6	Gypsum	2	0	65	0
7	Purple marl and gypsum	5	0	70	0
8	Gypsum and marl	10	0	80	0
9	Gypsum, marl, and skerry	20	0	100	0
10	Gypsum	3	0	103	0
11	Gypsum, marl, and skerry	17	0	120	0
12	Gypsum and grey marls	4	0	124	0
13	Purple marl	20	0	144	0
14	Skerry	4	0	148	0
15	Gypsum and marl	17	0	165	0
16	Sandstone	3	0	168	0
17	Gypsum, marl, and skerry	87	0	255	0
18	Grey sandstone	5	0	260	0
19	Gypsum, marl, and skerry	30	0	290	0
20	Red and grey marl	6	0	296	0
21	Hard grey marl	4	0	300	0
22	Grey marl	4	0	304	0
23	Red and grey marl	24	0	328	0
24	Grey marl	2	0	330	0
25	Red marl	10	0	340	0
26	Grey marl	1	0	341	0
27	Red marl	5	0	346	0
28	Red and grey marl	9	0	355	0
29	Gypsum	0	6	355	6
30	Sandy marl	14	6	370	0
31	Gypsum, skerry, and marl	30	0	400	0
32	Gypsum and a little marl	9	0	409	0
33	Grey skerry	7	0	416	0
34	Sandy marl and skerry	18	0	434	0
35	Gypsum	3	0	437	0
36	Sandy marl	10	0	447	0
37	Red marl	8	0	455	0
38	Hard grey marl	2	0	457	0
39	Sandy marl, skerry, and gypsum	21	0	478	0
40	Hard grey marl	2	0	480	0
41	Marl, skerry, and gypsum	12	0	492	0
42	Hard grey marl	1	0	493	0

WILLOW BROOK BORING.—*continued.*

		Thickness.		Depth.	
		Ft.	in.	Ft.	in.
43	Sandy marl and skerry -	32	0	525	0
44	Skerry with little marl	11	0	536	0
45	Sandy marl and skerry -	18	0	554	0
46	Gypsum	2	0	556	0
47	Sandy marl and skerry	24	0	580	0
48	Sandstone with mica	2	0	582	0
49	Purple sandy marl with skerry	28	0	610	0
50	Sandy marl with mica	3	0	613	0
51	Sandy marl with skerry	9	0	622	0
52	Marl with gypsum -	2	0	624	0
53	Sandy marl* -	16	0	640	0
54	Red sandstone - -	10	0	650	0
55	Red sandy marl with skerry -	10	0	660	0
56	Sandy marl (spring of water at base)	10	0	670	0
57	Sandy marl - -	20	0	690	0
58	Micaceous sandstone with black spots	1	0	691	0
59	Running sand -	43	0	734	0
60	Red sandstone - - -	7	0	741	0
	Tools broken in hole.				

Correlation of the above.

	Ft.	In.
Keuper Marl- -	- 640	0
Lower Keuper Sandstone (proved)	101	0

LODGE FARM, SPINNEY HILLS. (BORING NO. 1.)

Began November 14th, 1877. Stopped December 1st.
From Mr. Plant's MSS.

	——	Thickness.		Depth.	
		Ft.	in.	Ft.	in.
1	Soil and drift clay	5	0	5	0
2	Whitish yellow clay -	3	0	8	0
3	” ” ” -	5	0	13	0
4	” ” ” -	6	0	19	0
5	Reddish yellow clay -	9	0	34	3
6	Red clay - - -	6	3	28	0
7	Red clay and gypsum (gypsum bed 20 feet, 9 feet terra alba, 11 feet common)	36	0	70	3
				89	3
8	Red clay and marl	19	0		
	Stopped Dec. 1st to prepare shaft.				

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* Spring of pure water at bottom of running sand at 636 feet [?] rose 20 feet above top of borehole.

LODGE FARM, SPINNEY HILLS. (BORING NO. 2.)

Hole shifted to another part of 10 feet shaft, 8 feet in diameter, 3 feet south of No. 1 borehole, but in the same shaft. Began March 4th, 1878.* Copied from boring-book ; the particulars in brackets are from another account.

—	—			Thickness.	Depth.	Core obtained, 6in. Diameter of bore, 7in. Below 143ft. 3in. core obtained, 4in. Diameter of bore, 5in.	
			Ft. in.	Ft. in.	Ft. in.	Ft. in.	
	Limestone and shaly clay	Soil and earth	1 6				
		Gravel and sand	2 0	—	20 0		
Mar. 11	" "	Clay	4 6	6 2	26 2		Broken up.
" 12	" "	Grey-white sandy marl	20 5	2 3	28 5	2 3	
" 12	Red marl	Chocolate red marl	5 11	10 2	38 7	4 9	
		" " "	4 4				
" 13	Marl and gypsum	Chocolate-red marl	15 11	17 1	55 8	2 2	Marl.
		Pure solid gypsum	1 2			1 2	Gypsum
" 14	Gypsum and marl	Red marl	3 4	7 7	63 3	– 6	Marl.
		Gypsum, pure solid (pure terra alba)	– 9			– 9	Gypsum.
		Red marl mixedwith gypsum	3 6			3 6	Marl mixed with gypsum
" 14	Marl and inferior gypsum	Red marl mixed with gypsum	5 1	5 1	68 4	3 1	
" 15	Gypsum and marl	Gypsum, pure solid (pure terra alba)	– 7	—	—	– 7	
		Red marl (chocolate)	5 1	5 8	74 0	3 1	
" 15	Gypsum and marl	Red marl (chocolate)	3 5	8 0	82 0	2 6	Marl.
		Gypsum (pure terra alba)	– 7			– 7	Gypsum, good
		Red marl	4 0			4 0	Marl and gypsum.
" 16	Marl (Red marl)		11 7	11 7	93 7	6 7	
" 20	Marl and gypsum	Red marl	2 5	4 3	97 10	1 2	Marl.
		Gypsum (pure terra alba)	1 4			1 4	Gypsum, good
						– 6	Marl.
" 21	Marl		—	5 11	103 9		
" 21	Gypsum and marl		—	6 3	110 0	1 7	Gypsum with marl.
						1 5	Marl veined with gypsum.
" 22	Marl and thin gypsum		—	5 4	115 4	5 0	
	" "		—	3 2	118 6	3 0	
" 23	" "		—	6 7	125 1	6 0	
" 25	Marl with veins of gypsum		—	8 0	133 1	7 0	
" 26	" "		—	8 2	141 3	8 0	
" 27	" "		—	2 0	143 3	– 8	
April 1	Red marl		—	7 6	150 9	4 0	
" 2	"		—	10 0	160 9	7 0	At 165 grey-green marl.
						2 6	Red marl.
" 3	Blue marl with bands of sandstone		—	7 6	168 3	4 6	Blue marl with bands of sandstone.
" 4	" "		—	11 0	179 3	11 0	
" 4	" and red marl		—	10 9	190 0	8 0	
" 5	Red marl		—	4 8	194 8	4 0	
" 5	" with bands of sandstone		—	10 5	205 1	10 0	
" 6	Red marl and gypsum		—	10 6	215 7	9 0	
" 8	" "		—	10 0	225 7	10 0	
" 9	" "		—	14 5	240 0	13 10	
" 10	" "		—	16 2	256 2	15 8	252–253·4 grey rock.
" 11	" "		—	14 2	270 4	8 8	Broken ground
" 12	" "		—	9 3	279 7	6 2	" "
" 13	"		—	6 2	285 9	4 0	" "
" 16	Marl, grey rock and sandy marl		—	8 7	294 4	3 2	Marl.
						4 0	Grey rock.
						1 5	Sandy marl.
June 19	Marl and gypsum		—	7 2	301 6	3 6	
Aug.	" "		—	10 10	312 4	6 0	
" 21	Red marl and gypsum		—	2 8	315 0	2 0	
" 22	" "		—	16 6	331 6	11 0	
" 23	" "		—	10 9	342 3	10 6	
" 24	" "		—	7 0	349 3	5 0	

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* Borer says began January 7. These dates are of some importance in reading the reports which were drawn up at the time, and in understanding the controversy which arose about the several borings of the Evington Coal Boring Company.

LODGE FARM, SPINNEY HILLS (BORING NO. 2.)—*cont.*

—	—	Thickness.		Depth.		Core obtained, 4in. Diameter of bore, 5in.		
		Ft.	in.	Ft.	in.	Ft.	in.	
Aug. 26	Red mottled marls veined with gypsum	18	0	367	3	15	0	
„ 27	„ „	21	0	388	3	17	0	
„ 28	„ „	28	6	416	9	25	3	
„ 29	„ „	29	8	446	5	24	0	
„ 30	„ „	24	0	470	5	20	3	
„ 31	„ „	15	0	485	5	12	6	
Sept. 2	Sandy mottled marls and gypsum in thin veins	32	2	517	7	24	0	
„ 8	„ „	25	6	543	1	21	6	
„ 4	„ „	25	5	568	6	23	0	
„ 5	„ „	31	6	600	0	17	6	607ft. 10in. to 621ft. 8in. soft sandstones and water
„ 6	„ and sandstone	35	6	635	6	7 4	9 9	Do. and sandstone. Red sandstone and marls
„ 7	Red sandstone and marls	29	6	653	0	5	0	
„ 9	Marls and deep red sandstones	20	0	673	0	9	0	
„ 11	Marls and sandstone	18	10	691	10	–	8	
„ 14	Red and purple marl and sandstones	15	4	707	2	7	0	
„ 16	Purple-brown sandstones and marl	16	5	723	7	11	0	
„ 18	Breccia and sandstones	15	3	738	10	11	6	
„ 19	„	5	1	743	11	4	0	
„ 20	Purple shale	20	1	764	0	3	6	
„ 21	„	4	0	768	0	1	0	
„ 22	„	4	9	772	9	3	6	
„ 23	Dark shale, hard and jointy	17	0	789	9	4	0	The strata here is a rocky shale splitting at a high angle and, falling down, grinds away.
„ 24	„	4	3	794	0	—		
„ 25	Dark shale of slaty character	10	3	804	3	3	6	
„ 27	„ „	10	5	814	8	2	10	
„ 28	„ „	4	5	819	1	3	0	

CROWN HILLS, NEAR EVINGTON.

Copied from boring-book by Mr. Plant.

—	—		Thickness.		Depth.		Length of Core.		
			Ft.	in.	Ft.	in.	Ft.	in.	
Nov.	Clay (dug out)		2	8	2	6	—		Diameter of bore, 7$\frac{3}{16}$in.
„ 20	„ (light)		1	0	3	8	1	0	
„ 21	- - - -		4	0	7	8	—		
„ 22	Light clay		3	0	10	8	1	6	
	Limestone	3ft. 6in.*	—		—		–	2	
„ 25	„		—		—		–	3	
Dec. 1	Blue clay		2	0	12	8	1	6	
„ 2	Limestone	3in.	2	3	14	11	–	3	
	Blue clay		—		—		–	9	
	Limestone	7in.	—		—			7	
„ 8	Blue clay		5	1	20	0	–	11	Pebble found.
	Limestone	2in.	—		—		–	1½	
	Blue clay		1	5	21	5	1 1	7 1	
„ 4	„		2	5	23	10	–	6	
	Limestone	4in.	—		—			3½	
	Blue clay		—		—		–	1	
„ 5	Light clay		1	8	25	6	Not drawn.		
„ 6	„		–	10	26	4	None.		
	Blue clay		–	2	26	6	–	2	
	Limestone	6in.	–	5½	26	11½	–	5½	
	Blue clay		4	10½	31	10	None.		
	Limestone	3in.	–	3	32	1	–	3	
„ 9	Blue clay	12ft. 6in.	1	7	36	8	2	6	
	„		2	11	39	7	Not drawn.		
„ 10	„		2	0	41	7	4	5	
	„		3	0	44	7	2	7	
	Limestone	2in.	–	2	44	9	–	2	
	Blue clay	3in.		3	45	0		1	
	Limestone	2in.		2	45	2		2	
	Blue clay	8in.		8	45	10		5	
	Limestone	2in.	–	2	46	0	–	2	

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* The figures in this column are from another account, given on page 66, which was found among Mr. Plant's MSS. It is difficult to understand exactly what is intended, but the last column shows what was really brought up.

CROWN HILLS, NEAR EVINGTON—*cont.*

—	——		Thick-ness.		Depth.		Length of Core.	
			Ft.	in.	Ft.	in.	Ft.	In.
	Blue clay	2ft. 7in.	–	10	46	10	–	7
	"		1	9	48	7	1	5
	Limestone	2½in.		2½	48	9½	–	2½
	Blue clay	10in.	–	10	49	7½		5½
Dec. 11	Limestone			2	49	9½		2
	Blue clay		–	4½	50	2		3½
	Limestone		–	1¼	50	3¼		1¼
	Blue clay			2	50	5¼		0
	Limestone			1½	50	6¾		1½
	Blue clay			3	50	9¾		0
	Limestone			3¼	51	1		3¼
	Blue clay	6ft. 2in.	–	9	51	10	–	0
	"		4	11	56	9	4	2
	"			6	57	3	–	5
	Limestone		–	3½	57	6½	–	3½
	Blue clay	7ft. 9½in.	3	10½	61	5	3	0
	"		3	10	65	3	2	3
,, 12	"		–	1	65	4		0
	Limestone		–	1	65	5		1
	Blue clay		3	2	68	7		0
,, 13	"		1	3	69	10		6
	Limestone		–	1½	69	11½	–	1½
	Blue clay		2	6	72	5½	1	4
	Limestone		–	1	72	6½		1
	Blue clay		1	0	73	6½		2
	"		–	6	74	0½		3
	Limestone		–	1½	74	2	–	1½
	Blue clay		4	1	78	3	2	11
,, 16	Limestone		–	1½	78	4½	–	1½
	Blue clay		4	7	82	11½	4	0
	"		5	8½	88	8	5	1
	"		2	4	91	0	Not drawn.	
,, 17	"		3	4	94	4	4	10
	"		5	1½	99	5½	4	9
	"		1	6½	101	0	1	6
	Limestone		–	1	101	1	–	1
	Blue clay		3	7½	104	8½	1	7
	"		4	10	109	6½	2	8
,, 18	"		4	11½	114	6	5	2½
	"		4	10	119	4	4	2
	"		5	1	124	5	3	4
,, 19	"		5	3	129	8	5	6
	"		4	8	134	4	4	2
	Limestone		–	8	135	0	–	8
	Blue clay		2	11½	137	11½	2	6½
	Limestone		–	3½	138	3	–	3½
	Blue clay		2	0	140	3	1	8
	"		–	9	141	0	–	7
	Limestone		–	2½	141	2½		2½
	Blue clay			1	141	3½		—
	Limestone		–	2	141	5½		2
	Blue clay		3	9½	145	0		—
,, 20	Blue clay or blue shale		5	6	150	6	4	8½
	" "		3	0	153	6	2	8
	Limestone		–	4	153	10		4
	Blue clay		2	2	156	0		—
,, 22	"		–	1	156	1		1
	Limestone		–	1	156	2		1
	Blue clay		1	0	157	2		7
	Limestone		–	4½	157	6½		4½
	Blue clay			3	157	9½		—
	Limestone			3	158	0½		3
	Blue clay			9	158	9½		7
	Limestone			3½	159	1		3½
	Blue clay			3	159	4		—
	Limestone			3½	159	7½		3½
	Blue clay			4	159	11½		—
	Limestone			6	160	5½		6
	Blue clay			7	161	0½		—
	"			6	161	6½		6
	Limestone		–	3	161	9½	–	3
	Blue clay		4	5	166	2½	4	0
	"		5	5½	171	8	5	4
,, 23	"		5	2	176	10	4	11
	"		5	3	182	1	4	10
	"		5	2	187	3	4	1
,, 24	"		1	10	189	1	1	7
	White limestone mottled or mixed with blue clay		3	7	192	8	3	5
	" " " "		5	4	198	0	4	8
1880.	" " " "		5	4	203	4	4	10
Jan. 6	" " " "		1	0	204	4		7

CROWN HILLS, NEAR EVINGTON—*cont.*

—	——	Thickness.		Depth.		Length of Core.		
		Ft.	In.	Ft.	in.	Ft.	In.	
	White limestone shale	1	6	205	10	2	9	
Jan. 7	Mottled and red marl with band of gypsum	2	6	208	4			
	White limestone shale	2	0	210	4		8	
	Red marl	–	9	211	1		8	
„ 8	„ and gypsum	–	3	211	4			
	White limestone shale and band of gypsum	3	9	215	1	2	0	
„ 14	Red marl, limestone shale, and veins of gypsum	12	3	227	4	8	0	
„ 15	Red marl and gypsum	12	11	240	3	11	7	
	„ „	3	6	243	9	13	3	
„ 16	„ „	10	2	253	11			
	„ „	3	0	256	11	9	6	
„ 17	Gypsum (pure)	10	6	267	5	2	3	
	Red marl and gypsum	—		—		1	1	
„ 19	„ „	6	4	273	9	–	10	
	Gypsum	—		—		1	1½	
	Red marl and gypsum	—		—		2	1	
„ 20	„ „	9	0	282	9	6	8	
„ 21	„ „	13	2	295	11	13	1	
	„ „	3	0	298	11	3	4	
„ 22	„ „	7	7	308	6			
„ 23	„ „	6	1	312	7	2	0	
„ 24	„ „	4	1	316	8	5	6	
„ 26	Blue marl and gypsum	11	4	328	0	11	3	
„ 27	Red marl and gypsum	2	0	330	0	1	11	
	„ „	–	11	330	11	—		
„ 28	„ „	12	7	343	6	6	10	
„ 29	„ „	3	11	347	5	1	9	
	„ „	3	0	350	5	—		
„ 30	„ „	6	3	356	8	1	8	
	Red and blue marl and gypsum	7	6	363	11	12	11	
„ 31	„ „ „	10	10	374	9	6	6½	
Feb. 2	„ „ „	3	6	378	3	2	10	
	„ „ „	2	5	380	8	—		Diameter of bore, 3½ in.
„ 3	Red marl and gypsum	6	0	386	8	1	10	
	„ „	5	2	391	10	1	7	
„ 4	„ „	7	1	398	11	4	0	
Feb. 5	Red and blue marl and gypsum	7	5	406	5	4	7	Broken ground.
	„ „	6	5	412	10	3	3	
„ 6	„ „	3	4	416	2	2	6	
	„ „	2	9	418	11	1	10	
„ 7	„ „	7	3	426	2	4	10	
Mar. 19	Red marl with veins of gypsum	7	7	433	9	7	8	
„ 23	„ „	3	10	437	7	3	1	
„ 24	Red and blue marl with gypsum	10	5	448	0	7	7	
Apr. 1	„ „	10	2	458	2	7	11	
„ 2	„ „	9	4	467	6	6	9	
„ 3	„ „	6	2	473	8	3	6	
„ 8	Red marl	9	8	483	4	1	6	
	Blue marl with bands of gypsum	—		—		4	8	
	Red marl with one band of gypsum	—		—		4	4	
„ 22	Red and blue marl and gypsum	9	3	492	7	4	2	
„ 23	„ „	8	10	501	5	7	6	
„ 24	Red marl	1	6	502	11	—		
„ 26	„	–	9	503	8		3½	
„ 28	„	5	0	508	8	–	7	
„ 29	Red and blue marl and gypsum	10	6	519	2	7	2	
„ 30	„ „	7	11	527	1	4	10	
May 1	„ „	9	4	536	5	6	10	
„ 3	„ „	9	3	545	8	7	2	
„ 4	„ „	3	0	548	8	Not drawn.		
„ 5	„ „	6	6	555	2	7	0	
	„ „	4	2	559	4	Not drawn.		
„ 6	„ „	7	2	566	6	11	1	
	„ „	4	3	570	9	–	6	
„ 7	„ „	12	6	583	3	8	10	
„ 8	„ „	10	1	593	4	10	6	
„ 10	„ „	12	3	605	7	10	4	
„ 11	„ „	6	4	611	11	Not drawn.		
„ 12	„ „	2	4	614	3	3	10	
	„ „	10	2	624	5	6	5	
„ 13	„ „	12	5	636	10	10	10	
„ 14	„ „	12	2	649	0	6	1	
„ 15	„ „	8	3	657	3	1	9	
„ 20	„ „	11	0	668	3	9	10	
„ 21	„ „	11	0	679	3	9	4	
„ 25	Red marl	9	3	688	6	2	0	
„ 29	Red and blue marl and gypsum	11	0	699	6	9	7	
„ 31	„ „	11	11	711	5	10	0	
June 1	„ „	11	3	722	8	8	0	
„ 2	„ „	12	0	734	8	6	3	Sandstone at 731ft. (Plant).

Crown Hills, Near Evington—*cont.*

—	——	Thickness.	Depth.	Length of Core.	
		Ft. in.	Ft. in.	Ft. in.	
June 3	Soft sandstone and marl	13 4	748 0	3 8	
" 4	" "	9 10	757 10	2 4	
" 5	" "	9 4	767 2	3 10	
" 7	" "	4 7	771 9	1 8	
" 9	Soft sandstone	14 10	786 7	2 6	
	"	—	—	7	
	Red marl	—	—	1	
	Gypsum	—	—	- 2	
	Soft sandstone	—	—	1 3	
	Red marl	—	—	- 5	
10	Soft sandstone	15 5	802 0	3	
	Red and blue marl	—	—	8	
	Sandstone and gypsum	—	—	- 2	
	Red and blue marl	—	—	1 4	
	Sandstone	—	—	- 10	
	Red and blue marl	—	—	1 6	
	Sandstone	—	—	- 7	
	Red and blue marl	—	—	4	
	Coarse sandstone and red marl	—	—	8	
	Red and blue marl	—	—	4	
	Sandstone	—	—	- 3	
" 15	Soft red and blue marl	14 5	816 5	4 7	
	Sandstone	—	—	2	
" 17	Fine light red sandstone	19 2	835 7	4	
	Coarse dark red sandstone and gravel	—	—	-½	
	Coarse light red sandstone and gravel	—	—	1½	
	Red marl	—	—	1	
	Fine white sandstone	—	—	2	
	Coarse white sandstone	—	—	- 1	
	Red marl	—	—	- 11	
" 18	"	1 1	836 8	- 11	
	Hard purple rock with many veins at various angles.	5 6	842 2	5 4	
" 21	Hard purple rock	6 3	848 5	2 9	
" 22	Hard purple and black rock	1 10	850 3	- 2½	Struck at 848ft. 5in.
	Hard black rock	—	—	1 2	
" 23	" "	8 4	858 7	7 9	
" 24	" "	1 2	859 9	- 9	
" 25	" "	2 4	862 1	—	
" 26	" "	4 8	866 9	5 10	
" 29	" "	6 9	873 6	Not drawn.	
" 30	" "	3 0	876 6	8 6	
	" "	10 0	886 6	9 3	
July 1	Deep black slaty rock with vertical and angular veins, white.	11 8	898 2	9 6	Struck at 885ft.
" 2	Deep black slaty rock with vertical and angular veins, white.	9 7	907 9	6 6	
" 3	Deep black slaty rock with vertical and angular veins, white.	10 6	918 3	10 1	
" 5	Hard black slaty rock	14 0	932 3	9 9	
" 6	" "	14 2	946 5	11 9	
" 7	" "	13 0	959 5	11 6	
" 8	" "	10 5	969 10	10 3	
" 9	" "	15 2	985 0	10 5	
" 10	" "	9 11	994 11	5 10	
" 12	" "	5 4	1000 3	4 1	Rods measured by Mr. W. Howes, depth according to measure, 1,002ft. 3in.

Another account of the upper part of the above section, left in MS. by Mr. Plant :—

	Ft. in.
Soil	0 6
Light clay	8 8
Limestone	3 6
Blue clay	1 6
Limestone	0 3
Blue clay	0 11
Limestone	0 7
Blue clay	1 11
Limestone	0 2

CROWN HILLS, NEAR EVINGTON—*cont.*

	Ft.	in.
Blue clay	5	6
Limestone	0	4
Light clay	2	8
Limestone	0	6
Blue clay	4	11
Limestone	0	3
Blue clay	12	6
	44	8

Summary and Correlation of the Crown Hill Section.

—	Thickness.	Base reached at.
	Ft. in.	Ft. in.
Lias, including soil and weathered clay at the surface -	189 1	189 1
Rhætic beds, including the tea-green marls	16 9 or more	205 10
Keuper marl	525 2	731 0
Keuper sandstone	105 8	836 8

THE CO-OPERATIVE BOOT WORKS, KNIGHTON FIELDS.* (Chisel Boring.) Communicated by Messrs. Mather and Platt. Date of sinking, 1892.

—	Thickness.	Depth from Surface.
	Feet.	Feet.
Old well	57	—
Red marl	39	96
Blue shale and marl [grey shale and skerry sandstone]	12	108
Red marl and gypsum [bands of gypsum not more than one foot thick] -	132	240
Very soft red and blue marl	20	260
Very hard marl	6	266
Red marl with thin bands of green sandstone	4	270
Red marl and gypsum	220	490
Hard grey sand rock	12	502
Red marl and gypsum†	55	557
Fine red sand rock	11	568
Hard sandy marl	15	583
Hard fine red sandstone with thin beds of marl -	33	616
Coarse red sandstone with bands of white rock	6	622
Very hard dark blue and black shale	63	685
Very hard grey rock, limestone‡ [pyrites] -	83	768
Soft black shale	57	825

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[*] Other accounts of this boring are given by Mr. Paul, *Trans. Leicester Lit. Phil. Soc.*, 1893, p. 105 ; and by Mr. Montagu Browne, *op. cit.* p. 199.

[†] The presence of gypsum below 490 feet is doubtful, and, considering the character of the boring, may have fallen in from higher beds.

[‡] See appendix pp. 117.

VESTRY STREET BATHS.*

Sunk and communicated by Messrs. Legrand and Sutcliff, 1890.

——	Thickness. Ft.	in.	Depth. Ft.	in.
Basement floor below surface	–	–	10	0
Dug well	30	0	40	0
Red marl	18	0	58	0
Block marl	15	0	73	0
Red marl	4	0	77	0
Blue stone and clay [skerry sandstone and grey marl]	3	0	80	0
Red marl and gypsum [white sandstone]	14	0	94	0
Red marl	7	9	101	9
Red and blue stone	1	9	103	6
Gypsum	–	6	104	0
Mixture of marl and gypsum	61	0	165	0
Blue stone [mottled grey marl]	2	6	167	6
Red marl	41	6	209	0
Gypsum	1	0	210	0
Red marl	–	–	–	–

The additions in square brackets are from observation of the specimens. Mr. Paul states that the water-level is 17 feet below the surface.

LONDON ROAD. MESSRS DAVIS, MOORE, AND CO.†

Sunk and communicated by Messrs. G. Isler and Co., per Mr. W. Whitaker. Water-level 29 feet down. Supply abundant. Shaft 46 feet, the rest bored.

——	Thickness. Ft.	in.	Depth. Ft.	in.
Red marl	53	0	53	0
Hard grey stone	4	0	57	0
Hard red marl	20	6	77	6
Red marl and grey stone	7	6	85	0
Coloured marl	4	0	89	0
Blue marl	3	0	92	0
Rock	10	11	102	11
Red marl	2	0	104	11
Rock	5	0	109	11
Rock and marl	6	0	115	11
Gypsum and marl	7	6	123	5
Gypsum	3	0	126	5

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* A slightly different account of this boring is given by Mr. Paul, *Trans. Leicester Lit. and Phil. Soc.*, 1891, p. 408, and by Mr. Montagu Browne, *Ibid.*, 1893, p. 152.

† The account given of a boring at this place by Mr. Plant, *Brit. Assoc. Rep.* for 1889, p. 74, copied on page 77, does not agree very well with this.

A slightly different account gives

------	Thickness.		Depth.	
Dug well	50	0	–	–
Red marl	3	0	53	0
Hard grey stone	4	0	57	0
Hard red marl	30	0	87	0
Blue marl	3	0	90	0
Rock	17	9	107	9
Marl rock	3	9	111	6
Marl	9	6	121	0
Gypsum	3	0	124	0

1, Charnwood Street. Leicester Brewing and Malting Company.

Sunk and communicated by Messrs. Isler and Co. Boring made in 1895.

——	Thickness.		Depth.	
	Ft.	in.	Ft.	in.
Dug well*	59	0		–
Red marl	10	6	69	6
Hard red and grey rock	4	0	73	6
Hard red rock	7	3	80	9
Stone	4	6	85	3
Red stone	3	0	88	3
Red marl stone	13	9	102	0
Blue shale and stone	3	6	105	6
Green rock	6	0	111	6
Blue rock	2	6	114	0
Green stone	3	6	117	6
Greyish stone	1	6	119	0
Very hard rock	4	7	123	7
Green and red shale and rock	2	9	126	4
Red sandstone and shale	3	0	129	4
Red sandstone	7	6	136	10
Sandstone	22	6	159	4
Red sandstone	3	0	162	4
Red stone	3	0	165	4
Red sandstone	3	6	168	10
Red stone	5	0	173	10
Sandstone	3	2	177	0
Red rock	11	6	188	6
Hard stone	11	6	200	0

Water-level, 36 feet below the surface. Supply, two barrels a minute.

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*The details of this well are given on p. 76.

MESSRS. ELSE AND FROME.

Boring made in 1884. Sunk and communicated by Messrs. Legrand and Sutcliff, per Mr. W. Whitaker.

—	Thickness.		Depth.	
	Ft.	in.	Ft.	in.
Dug well	50	0	–	–
Red and grey marl	6	0	56	0
Hard shaly marl	17	0	73	0
Hard blue marlstone	9	6	82	6
Blue marl rock	3	0	85	6
Light [coloured] sandstone	4	6	90	0
Light [coloured] marl	5	6	95	6
Red marl rock	14	6	110	0
Hard red marl and gypsum	30	0	140	0

Water-level, 45 feet below the surface. Supply, 15 gallons a minute.

WALNUT STREET.

Boring made in 1894. Sunk and communicated by Messrs. Tilley.

—	Thickness.		Depth.	
	Ft.	in.	Ft.	in.
Clay	2	0	–	–
Gravel	6	0	8	0
Light [coloured] marl	7	0	15	0
Red marl	21	6	36	6
Light [coloured] sandstone with water	2	0	38	6
Red marl	11	6	50	0
Light [coloured] sandstone with water	1	10	51	10
Red marl (veins of gypsum)	24	10	76	8
Loamy sand with water	5	4	82	0
Red marl	17	0	99	0
Red marl with veins of gypsum	15	0	114	0
Mixed marl	22	0	136	0
Red marl with one inch of hard sandstone at the top	5	6	141	6
Sandstone	1	3	142	9
Red marl	1	0	143	9
Sandstone	–	6	144	3
Hard red marl	5	9	150	0
Red marl and gypsum	4	0	154	0
Sandstone with water	–	4	154	4
Red marl mixed	15	8	170	0

ALL SAINTS' BREWERY (MESSRS. LANGMORE AND BANKHART).

Sunk and communicated by Messrs. Legrand and Sutcliff, 1884, per Mr. Whitaker. Water-level, 27 feet down. Yield, 40 gallons a minute.

——	Thickness.		Depth.	
	Ft.	in.	Ft.	in.
Dug well (the rest bored)	–	–	45	0
Red marl	7	0	52	0
Soft blue stone	4	0	56	0
Purple marl and soft marl in layers	9	0	65	0
Sandstone	2	0	67	0
Soft red marl	3	0	70	0
Soft red sandy marl	15	0	85	0
Red marl and sandstone	9	0	94	0
Red marl and gypsum	13	0	107	0

AYLESTONE ROAD GAS WORKS.

Boring made in 1877. Sunk and communicated by Messrs. Docwra and Sons, per Mr. Whitaker.

	——	Thickness.		Depth.	
		Ft.	in.	Ft.	in.
Alluvial beds, 11ft. 6in.	Black soil	–	6	–	6
	Loamy clay	1	6	2	0
	Sandy clay with stones	2	0	4	0
	Red loamy sand	2	0	6	0
	Red clay mixed with rock stones	3	0	9	0
	Greenish sandy clay mixed with rock stones	2	6	11	6
	Light grey rock	6	6	18	0
	Light grey rock (soft)	3	0	21	0
	Red sandy marl	22	0	43	0
	Hard red rock	2	0	45	0
	Soft red sandy marl	4	0	49	0

CORPORATION WATERWORKS, NEW PARKS.

Boring made in 1895–96. Sunk and communicated by Messrs. Isler and Co.

——	Thickness.		Depth.	
	Ft.	in.	Ft.	in.
Dug well	18	0	–	–
Blue marl	7	0	25	0
Red marl	46	0	71	0
Stone	1	6	72	6
Red marl	39	6	112	0
Blue and red marl	10	0	122	0
Red marl	4	0	126	0
Stone	7	0	133	0
Red marl	7	0	140	0
Stone	14	0	154	0
Red marl	6	0	160	0
Stone	–	2	160	2

Water-level, 100 feet from surface.

SPINNEY HILLS AND CROWN HILLS.

Shallow borings sunk by T. R. Bosworth, between November 26th, 1878, and January 17th, 1879. From Mr. Plant's MSS.*

BORE No. 1.—[Spinney Hill Park, about 120 yards north-east of the south west gates.] Water at 19 feet.

	Ft.	in.
Soil	0	9
Yellow clay	2	3
Light Lias [Rhætic] shale, plastic clay	10	0
Tea-green marls (not penetrated)	17	0

BORE No. 2.—About 80 yards N.N.E. of No. 1. [Both Bore No. 1 and No. 2 are about 70 yards from the Mere Road.] Water at 23 feet.

	Ft.	in.
Soil	0	9
Yellow clay	4	3
Light Lias shale or Rhætic	22	0
Tea-green marls, Rhætic	16	0
Band of red clay	4	0
Rhætic [?]	3	0

BORE No. 3.—264 yards south-east of No. 4; 1,350 yards from No. 1 1,760 yards from Willow Brook [Boring]. [Near the old tramway in the field between the two Limestone Pits.]

	Ft.	in.
Soil	0	9
Red and yellow marls mixed	9	9
Yellow marl with small limestone	1	9
Blue Lias shale	3	0
Limestone in layers	0	4
Shale in layers	0	4
Limestone in layers	0	3
Shale in layers	0	3
Limestone in layers	0	4
Shale in layers	0	3
Limestone in layers	0	5
Blue Lias shale with irregular layers of limestone	40	0

BORE No. 4.—165 yards south-east of No. 5. [Near the summit of the hill in the same field as the old Limekilns.]

	Ft.	in.
Soil	0	9
Yellow clay	11	0
Light (Lias) shale	23	0
Dark blue Lias shale	5	0

At 42 feet there was a strong rush of air (or gas), which continued for three days when the top of the bore was closed.

BORE No. 5.—560 yards south-east [? 840 yards due east] of Lodge Farm. [In the same field as the last, and 260 yards north of the Limekilns.] Water at 15 feet.

	Ft.	in.
Soil	0	9
Yellow marl	15	0
Dark (plastic) Lias clay, with scattered crystals of fibrous gypsum and selenite	10	0

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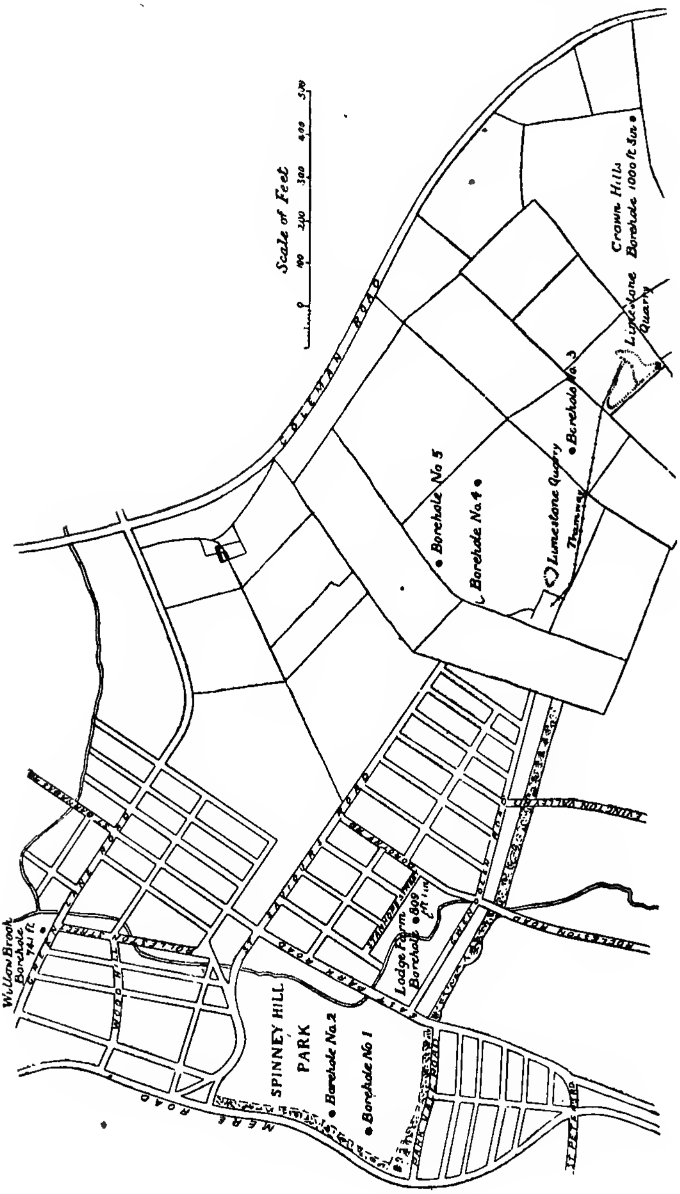
* The positions of the boreholes as marked on a plan of the estate are given in square brackets.

FIG. 15.—*Plan of North Evington, Leicester. Showing position of boreholes of the Evington Coal Boring Company.*



BORE.—Lodge Farm, 460 yards south-east of No. 2.

	Ft.	in.
Soil	0	9
Yellow clay	4	3
Light grey clay	14	9
Red (light) clay	15	6
Red marl with thin veins, vertical and horizontal, of gypsum ; thin bands of gypsum and nodules of gypsum	23	6

CROWN HILLS (Quarry No. 1).

From Mr. Plant's MSS.

	Ft.	in.
Shale*	5	0
Limestone	0	9
Shale*	2	0
Limestone	0	6
Shale*	1	0
Limestone	0	5
Shale*	1	3
Limestone	4	7
Shale	0	0
Limestone	0	6
Shale*	1	6
Limestone	0	6
Shale	1	6
Limestone	0	5
Total depth	19	11

CROWN HILLS (Quarry No. 2.) Section of Pit near the Kilns.

From Mr. Plant's MSS.

	Ft.	in.
Shale	3	7
Limestone	0	3
Shale	0	6
Limestone	0	5
Shale	0	8
Limestone	0	3
Shale	0	6
Limestone	0	4
Shale	1	0
Limestone	0	4
Shale	0	8
Limestone	0	6
Shale	1	9
Limestone	0	3
Shale	1	0
Limestone	1	0
Total depth	13	0

Leicester.

The following are taken from the Reports of the British Association on the circulation of underground waters, with the omission of some of the correlations which are incorrect. The additions in italics are from Mr. Plant's MSS. ; those in square brackets are our explanation of the statements :—

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*These are called "Drift" in the original.

Messrs. Fielding and Co. [? Bond Street, 201 feet above o.d.]

B. A. Report, 1875, p. 134.
Well, 8 feet diameter. No borehole.
Water stands at 35 feet, reduced by pumping to 10 feet.

	Ft.	in.
Soil	2 0 to 6	0
Clay and sand *and sharp sandy gravel* [valley deposit]	10	0
Red marl	30	0
Red and grey marl [with skerry and some] beds of sandstone, alternating and full of ripple marks	29	0
Total depth	75	0

Messrs. Fielding and Co., Bond Street, 214 [201 ?] feet above o.d.

B. A. Report, 1889, p. 74.
Well, 50 feet. Boring, 80 feet. *Sunk July, 1884.*
Water stands 20 feet from the top.

	Ft.	in.
Soil	1	0
Boulder-clay [valley deposit]	14	0
Marl with two gypsum beds	35	0
Shales with gypsum [marls and skerry]	16	0
Sandstone	14	0
Shales [marls and skerry]	11	0
Red marl with four gypsum beds [and some] white sandstone	40	0
Total depth	131	0

Messrs. Hodges and Sons [? Lower Brown Street, 200 feet above o.d.], 206 feet above o.d.

B. A. Report, 1875, p. 134.
Well, 90 feet, 9 feet diameter.
Water stands at 50 feet.

	Ft.	in.
Drift [valley deposit]	10	0
Red marl	35	0
Sandstone [?]	45	0
Total depth	90	0

Messrs. Pickard and Sons [? Oxford Street, about 200 feet above o.d.] 206 feet above o.d.

B. A. Report, 1875, p. 135.
Well, 75 feet, 8 feet diameter.
Water stands at 30 feet.

	Ft.	in.
Drift [valley deposit]	15	0
Red marl	25	0
Sandstone [? marl and skerry]	35	0
Total depth	75	0

MESSRS. EVERARD AND CO., SOUTHGATE STREET BREWERY, 203 feet above O.D.

B. A. Report, 1875, p. 135.
Well, 50 feet, 7 feet diameter.
Water stands at 15 to 20 feet.

	Ft.	in.	Ft.	in.
Clay, etc. [made ground]	30	0	*20*	*0*
Sandstone [? marl and skerry sandstone]	20	0	*30*	*0*
Total depth	50	0		

MESSRS. RUST AND CO. [ST. NICHOLAS' SQUARE, 200 to 205 feet above O.D.

B. A. Reports, 1875, p. 135.
Well, 80 feet.
Water stands at 40 feet.

		Ft.	in.
Soil	[mostly made ground]	10	0
Clay, sand, and gravel		30	0
Alternate bands of sandstone and red clay		40	0
Total depth		80	0

MESSRS. BATES AND SONS' BREWERY, UPPER CHARNWOOD STREET 203 feet above O.D.*

B. A. Reports, 1878, p. 387.
Well, 62 feet [?], 6 feet diameter.
Water stands at 30 feet.

	Ft.	in.
Drift	8	0
Marl	52	0
Total depth	60	0

MESSRS. GIMSON AND CO. [VULCAN STREET, above 195 feet above O.D.], 212 feet above O.D.

B. A. Reports, 1878, p. 387.
Well, 64 feet, 6 feet diameter.
Water stands at 30 feet.

	Ft.	in.
Drift [?]	6	0
Marl	58	0
Total depth	64	0

MESSRS. W. GIMSON AND SONS, CHURCH GATE, Near St. Margaret's Church, 183 feet above O.D.

B. A. Reports, 1878, p. 388.
Well, 70 feet *from street level*, 8½ feet diameter.
Water stands at 55 feet.

	Ft.	in.
Gravel, sand, and clay	10	0
Marls	25	0
Hard blue rock stone	35	0
Total depth	70	0

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* The lower part of this section is given on p. 69, under the heading 51, Charnwood Street.

Messrs. Cooper, Corah and Sons, St. Margaret's Works [**Canning Street**, about 174 feet above O.D.]. Sunk in 1876.

B. A. Reports, 1880, pp. 105, 106.

Well, 26 feet; diameter, 3 feet 6 inches. Bore, 58 feet; diameter, 4 inches.

Water stands at 72 feet, 6 feet below neighbouring canal.

	Ft.	in.
Gravel and soil	10	0
Marl	48	0
Layers of hard and soft sandstone	26	0
(Running sand at the bottom.)		
Total depth	840	

Messrs. Scott and Sons, Bay Street Mills [177 feet above O.D.]. Sunk in 1860.

B. A. Reports, 1880, p. 106.

Well, 45 feet; diameter, 4 feet. Bore, 25 feet; diameter, 4 inches

Water stands 15 feet from the surface, about 8 feet below canal.

	Ft.	in.
Clay and gravel	12	0
Marl	36	0
Sandstone [probably marl and skerry]	22	0
Total depth	70	0

Messrs. Jessop and Co., Friday Street [177 feet above O.D.]. Sunk in 1876.

B. A. Reports, 1880, p. 106.

Well, 33 feet; 4 feet diameter. Bore, 37 feet; 4 inches diameter.

Water stands at 50 feet.

	Ft.	in.
Clay and gravel	12	0
Marl	38	0
Sandstone [?]	20	0
Total depth	70	0

Messrs. Davis and Co., London Road, 220 [209] feet above O.D.

B. A. Reports, 1889, p. 75.

Well, 70 feet; 6 feet diameter. Bore, 80 feet; 6 inches diameter.

Water stands at 20 feet.

	Ft.	in.
Drift [?]	20	0
Marl with gypsum beds	25	0
Sandstone and shales	45	0
Red marl with gypsum beds, and thin beds of sandstone	60	0
Total depth	150	0

Messrs. Raven and Co., Wharf Street, 186 feet above O.D.

B. A. Reports, 1889, p. 75.

Bore, 120 feet, 7 inches diameter; 84 feet, 6 inches diameter.

Water stands 20 feet from the surface.

	Ft.	in.
Drift.* *Below the level of Wharf Street*	8	0
Marls. *Marl,* 10 *feet; chocolate marl,* 15 *feet*	25	0
Sandstone A. *White sandstone,* 59 *feet*	30	0

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* The "Drift" is probably hypothetical. The boring appears to have commenced in the basement at a depth of 8 feet below the street. Mr. Plant's MS. notes, which are given in italics, differ considerably from the correlation published.

MESSRS. RAVEN AND CO.—*cont.*

	Ft.	in.
Middle sandstone B.	20	0
Lower shaly sandstone C.	22	0
Red marl with gypsum bands. *Marly beds with gypsum, 79 feet*	69	0
Red marl with bands of shaly sandstone. *Red marl with bands of sandstone, 33 feet*	30	0
Total depth	204	0

The following sections numbered 1 to 13 are from Mr. Plant's MSS.

(1) BAY STREET WHARF (boring).

	Ft.	in.
Soil and red clay	17	0
Soft silicious white sandstone* (of same character as thick bed at cutting)	2	0
Red clay	10	0
Total depth	29	0

(2) MIDLAND RAILWAY (Excavation at the Station).

	Ft.	in.
Drift clay and gravel	20	0
Hard green drab arenaceous clay, extends all over the excavation as a floor	3	0
Total depth	23	0

(3) HINCKLEY ROAD, JUNCTION WITH NARBOROUGH ROAD.

Keuper sandstone thins out, and is succeeded by a blood-red chocolate sandy clay.
Depth of grey sandy shales exposed, 10 feet.

(4) NEWFOUNDPOOL (boring).—Keuper, 1,000 feet.

(5) HUMBERSTONE (well).

	Ft.	in.
1. Soil, sand with rolled Oolite pebbles	2	0
2. Drift composed of Lias, Oolite with Belemnites, and blue shale with pyrites, blocks scored and grooved	66	0
3. Fine (grey pink) sands, appears to crop out in valley	9	0

(6) MOWMACRE HILL (boring).

	Feet.
Drift clay Gravel and sand with Oolitic boulders	120

(7) EVINGTON FIELDS Deep Sewer (Eastern).—St. Stephen's Road or Melbourne Road [?]. Depth 20 to 30 feet, stiff Boulder-clay with erratics.

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*Cut through at Bowman's Well, Frog Island.

(8) Rust's Factory, Holy Bones (sinking).*

—	Thickness.		Depth	
	Ft.	in.	Ft.	in.
Made soil and black earth } mostly made	10	0	10	0
Alluvial clays, etc. } ground	35	0	45	0
Keuper sandy shales	3	0	48	0
Chocolate marls	3	0	51	0
Green marls	1	0	52	0
Chocolate marls	3	0	55	0
Alternate layers of sandy shales and green marls	20	0	75	0
Red clay	1	0	76	0

(9) Jarrom's Well, Freehold Lane, Stoneygate.

—	Thickness.		Depth.	
	Ft.	in.	Ft.	in.
Alluvium [?]	3	0	3	0
Lias shales and limestone	96	0	99	0
Keuper marls	6	0	105	0

(10) Bond Street.—Sewer in Clay and sand 14 feet.

(11) Newarke.—Sandstone reached.

(12) Newarke Street, into Newarke.—Thin bed of sandstone.

(13) Causeway Lane (Well).
Alluvium [?].
Marls.
Sandstone.

The following, numbered 1 to 30, are taken from notes made on a map of Leicester by Mr. Plant:—

(1) Grey Friars.

	Ft.	in.
Soil	2	0
Coarse gravel	4	0
Sand	2	0
Gravel	4	0
Red-clay	2	0
Total depth	14	0

(2) Grey Friars.—Angular erratics at 20 feet.

(3) Wharf Street.—Red and yellow sand from Russell Square to top of Wharf Street. Red marl and dark sand opposite Wharf Street, at top of Rutland Street. Thin clay underlies the sand.

(4) Granby Street and Rutland Street.—Elephant's teeth in Drift with large erratics.

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* May be the same as that given on p. 76.

(5) GRANBY STREET AND HORSEFAIR STREET.—Red sand at 4 feet, 12 feet thick.

(6) CLOCK TOWER.—Red sand at 6 feet.

(7) BOND STREET.—Blue stiff clay mottled red.

(8) CHURCH GATE (North end).—Blue stiff clay mottled red.

(9) BAY STREET.—Keuper shales at 6 feet.

(10) LOWER BROWN STREET.—Keuper shales at 55 feet.

(11) OLD GAS WORKS.—Drift sand, red. Shales of Keuper at 55 feet below 5 feet red marl.

(12) UPPER TICHBORNE STREET AND ST. STEPHEN'S ROAD.—Erratic blocks. Sandy clay. Blue sandy mottled clay, rolled boulders and blue-grey partings.

(13) LEADENHALL STREET.—Earth and soil 2 feet. Blue coarse gravel and sharp red gravel with flints down to 12 feet.

(14) CEMETERY.—Stiff red clay with boulders up to two tons. Flints, etc. Gypsum bed at 10 feet.

(15) CATTLE MARKET.—Stiff red clay. Boulders, granite, one to three tons. Gypsum at 12 feet.

(16) DANE HILLS.—Middle bed of Keuper at surface.

(17) ST. NICHOLAS STREET.—Soil 2 feet. Grey clay, chocolate clay. Lower shales of Keuper.

(18) LUNATIC ASYLUM, field north of. Sand at 4 feet, 10 feet thick.

(19) RAWSON STREET.—Soil 1 foot. Fine red sand 11 feet. At bottom many erratics, not Leicestershire.

(20) REGENT'S ROAD, end of Salisbury Road. Soil 1 foot. Stiff blue mottled clay 6 feet, rolled erratics, flints, etc.

(21) VICTORIA ROAD.—Soil 1 foot. Stiff mottled blue and red clay with patches of sand. Boulders in profusion. Sand 35 yards wide, 10 feet deep.

(22) VICTORIA ROAD AND LANCASTER STREET.—Thick bed of sandstone 8 feet below the road.

(23) VICTORIA ROAD, field south of road, opposite corner of cemetery.—Soil 2 feet. Stiff red mottled clay. Flints numerous. Erratics. Block of granite (10 tons) at 12 feet.

(24) VICTORIA PARK.—Soil 2 feet. Clay mottled with sand to 30 feet.

(25) MARKET PLACE.—Angular erratics at 20 feet.

(26) ABBEY PARK ROAD (South end.)—Gravel with tusk of *Mammoth*, at base resting on red clay.

(27) ABBEY PARK ROAD, a little north of the south end.—*Rhinoceros* teeth, *Succinea*, *Lymnea*, etc.

(28) WELFORD ROAD, Opposite the Cemetery.—Boulder-clay 14 feet, with worn Lias limestone. Sand and blue clay with large and small pebbles, much rounded and scratched.

(29) HUMBERSTONE GATE, Secular Hall.—Bed of red sand.

(30) ST. STEPHEN'S ROAD.—Drift 30 feet.

The following sections numbered 1 to 29 are taken from Mr. Montagu Browne's very detailed account of "The Geology of the Borough of Leicester."* In this account there are between 200 and 300 sections; from these we have selected those which have a bearing on the mapping, or illustrate special points in the geology of the country. Some of these in particular districts we have summarised, instead of giving each individual section:—

(1) HINCKLEY ROAD, 45 YARDS WEST OF FOSSE ROAD.

	Ft.	in.
Macadam and gravel	1	8
Grey shale and sandstone	2	5
White sandstone	1	0
Grey marl, hard	4	6
White sandstone, very hard (indef.)	1	5
Total depth	11	0

(2) JUNCTION OF HINCKLEY ROAD AND FOSSE ROAD.

	Ft.	in.
Macadam	0	3
Grey shale, soft	2	2
White sandstone	1	0
Skerry	4	1
White sandstone	0	7
Skerry	4	6
Red marl (indef.)	3	11
Total depth	16	6

(3) MIDDLE OF WEST STREET, BRAUNSTONE GATE.

	Ft.	in.
Filling	5	1
Black clay	1	5
Sandy gravel	4	10
Sand	3	11
Gravel (indef.)	0	0½
Total depth	15	3½

(4) BRITON STREET, HALF-WAY BETWEEN NARBOROUGH ROAD AND RIVER

[About 550 yards south-east of No. 2.]

	Ft.	in.
Soft grey marl	2	0
Hard grey marl	6	0
Soft grey marl	2	0
Red marl (indef.)	5	6
Total depth	15	6

(5) ON BOULEVARD, NEAR MILL LANE WHARF.

[Average of three sections.]

	Ft.	in.		Ft.	in.
Filling	5	10	to	7	11
Blue clay	2	0	„	6	4
Gravel and sand	4	8	„	7	9

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* *Trans. Leicester Lit. Phil. Soc.* 1893, p. 123 *et seq.* Since this memoir has been in the press Mr. Browne has published several sections on the Beaumont Leys Estate. *Ibid.* 1902, p. 7 *et. seq.*

(6) Junction of Mill Lane and Brudenel Street.

	Ft.	in.
Made ground	3	11
Loamy gravel	3	0
Brown clay	0	6
Sand and gravel	5	10
Red marl	2	9
Total depth	16	0

(7) Havelock Street.

[Average of four sections.]

	Ft.	in.		Ft.	in.
Made ground	2	1	to	4	0
Dark clay and soil	2	5	,,	4	2
Yellow clay	1	0	,,	2	8
Sandy gravel	2	7	,,	5	1
Total depth of superficial beds	11	6	to	13	0

(8) Junction of Asylum Street and Richmond Street.

	Ft.	in.
Filling	10	0
Skerry	1	0
Sandstone	2	0
Skerry	1	0
Sandstone	1	0
Skerry	3	0
Total depth	18	0

(9) Castle Yard, Opposite Centre of St. Mary's Church.

	Ft.	in.
Filling	7	0
Soil, bones, etc.	3	0
Gravel, sand, and clay	6	0
Red marl	15	0
Total depth	31	0

(10) The Newarke to the End of Grange Lane.

[Average of four sections.]

	Ft.	in.		Ft.	in.
Filling	4	0	to	6	0
Loam, sand, and gravel	2	0	,,	4	0
Total depth of superficial beds	7	0	to	10	0

(11) Infirmary Square and Along Lancaster Street to the Railway.

Several sections only showing filling over red marl.

(12) Aylestone Road, Opposite End of Knighton Street.

	Ft.	in.
Filling	2	9
Clay with stones	2	0
Sand	2	3
Total depth	7	9

13) CASTLE STREET, MESSRS. EVERARD AND CO.'S BREWERY.

Well sunk in 1886, 45 feet from the one given on p. 76.

	Ft.	in.
Cellar below roadway -	10	0
Pump pit, stated to be excavated in "the ordinary town filling" -	11	0
Red marls	10	0
Indurated red marls	29	0
Red marls and grey marls in layers, with harder "skerries"	5	0
Indurated grey marls and sandstone with grey marly partings ("skerries")	9	0
Grey marl	3	0
Red marl - - -	14	0
Red and grey marls and "skerries" and a little gypsum	13	0
Red and grey marls with gypsum, apparently in considerable quantity	42	0
Reddish chocolate and grey, sandy, much indurated marls, with stainings of manganese -	4	0
Total depth	150	0

(14) BOTTRELL'S YARD, SOUTHGATE STREET.

	Ft.	in.
Black soil and various filling	60	0
Roman wall (3 feet 6 inches in width)	9	0
Red marl - -	5	0
Total depth	74	0

(15) ABBEY LANE.

[Average of five sections.]

	Ft.	in.		Ft.	in.
Sand and gravel, with clay in places	7	8	to	13	0

Red and grey marls below.

(16) EASTERN END OF SANVEY GATE, MESSRS. W. GIMSON AND SONS

[About 120 yards from the one given on page 76.]

Supply of hard water very abundant, stands at 17 feet.

	Ft.	in.
Filling -	5	0
Gravels -	20	0
Red and grey marls - -	7	0
Total depth -	32	0

(17) NEAR THE NORTH-WEST CORNER OF SPINNEY HILL PARK

Measured by Messrs. Hodges and Bates.

	Ft.	in.
Soil -	0	6
Drift clay -	3	0
Bluish clay	2	0
Shales, light-coloured	2	4
Darker shales - -	1	8
Still darker shales	1	10
Bone bed	0	1
Tea-green marls -	0	10
Total depth -	12	3

(18) MERE ROAD, IN MAN-HOLE ABOUT 320 FEET NORTH OF END OF ST. PETER'S ROAD.

Measured by Messrs. Bates and Hodges.

	Ft.	in.
Soil and glacial drift, containing rolled pebbles, etc.	8	0
Rubble or decomposed limestone, containing spines of *Echinus* and plates of *Pentacrinus* - - -	2	0
Band of fossiliferous limestone, containing *Ammonites Johnstoni* - - -	0	4
(Further S.S.E. this bed increases to 2 feet.)		
Shales - - -	3	10
Nodular band with overlying ferruginous seam	1	2
Total depth - -	15	4

(19) MERE ROAD, 8 YARDS NORTH OF KERB OF ASHBOURNE STREET

	Ft.	in.
Humus -	0	9
Clay (rainwash), stiff, reddish, with a few pebbles	0	6
Yellowish-grey Rhætic clay, with impersistent rusty bands and small limy lumps [race]	3	0
Rhætic limestone, large, nodular, ovoid and septariform, with calcite; reported as being "horse-backed"- 0 5 to	0	6
Shales, reported as being of the same nature, but more "dicey" - - -	9	4
Total depth	14	0

(20) MERE ROAD, SUMMIT OF HILL OPPOSITE PARK GATES.

	Ft.	in.
Boulder-clay - - -	9	6
Rhætic "grey rock"	1	0
Total depth -	10	6

(21) DALE STREET, 89 YARDS FROM KERB IN MERE ROAD.

	Ft.	in.
Lower Rhætic shales -	4	0
Bone bed (indef.).		
Tea-green marls	3	0
Total depth	7	0

(22) SOUTH KNIGHTON, UNIVERSITY ROAD, 118 FEET FROM KERB OF KNIGHTON CHURCH ROAD.

	Ft.	in.
Sandy drift [valley deposit]	6	6
Yellow shales -	2	9
Dark shales	2	0
Light grey fissile limestone, containing minute Ammonites —*Am. planorbis* - - - - - - - - - -	0	3
Total depth -	11	6

(23) Sewer in Field South-west of End of Knighton Church Road, 145 yards West of Cross Hedge.

	Ft.	in.
Humus, rainwash	1	0
Stiff yellowish clays or marls	4	0
Lower Lias limestone, 3 to 4 inches	0	3
Dark shales, not proved.		
Total depth	5	3

(24) At Cross Hedge, 95 Feet West of the Preceding Section.

	Ft.	in.
Humus, rainwash	1	2
Stiff yellow clays or marls, showing but little lamination, and partly or wholly reconstructed	3	6
Rhætic shales, thickly laminated	4	4
Total depth	9	0

(25) Knighton Church Lane, in Line with Pond.

	Ft.	in.
Filling	1	0
Rhætic dark grey shales	3	0
Rhætic nodular limestone, 3 to 4 inches	0	4
Rhætic bluish-black shales	4	6
Total depth	8	10

Sections just above this show the commencement and gradual thickening of the drift.

(26) Aylestone Road, about 50 Yards North of Cat's Lane.

	Ft.	in.
Alluvium, very sandy, free from stones, apparently tinged with a little Keuper red marl	10	0
Alluvium, nearly black, apparently composed of vegetable matter. Rolled and subangular large flints at base	2	0
Sandy, reconstructed, Keuper marls	2	0
Total depth	14	0

(27) Richmond Road, Aylestone Park, 50 Yards from Landsdown Road.

	Ft.	in.
Filling	1	3
Sands and gravel, with large blocks of Carboniferous sandstone, containing plant-remains	6	0
Red marl	1	3
Total depth	8	6

(28) Aylestone Road Gas Works. [Trial hole about 200 yards from the road.]

	Ft.	in.
Made ground	4	0
Humus	1	0
Stiff clay (homogeneous, with no stones), changing in colour from yellow to grey	5	0

	Ft.	in
Stiff dirty clay, with flints and pebbles	0	10
Dirty gravel, with flints and pebbles -	0	10
Rusty red band -	0	1
Rather dark gravel, rather coarse and stony	1	0
Rusty red band	0	1
Greyish coarse gravel and sand, with quartz pebbles	1	0
Rusty red gravel -	0	1
Rather coarse gravel and sand, with quartz pebbles	0	10
Fine sand and quartz pebbles -	0	9
Rusty red gravel and boulders, with a few broken pieces of Upper Keuper Sandstone, and antler of Reindeer	0	1
Upper Keuper grey and red marls.		
Total alluvial beds - -	11	7

(29) FLOOD-WORKS BASIN, JUST NORTH OF THE VIADUCT ON THE BURTON RAILWAY.

	Ft.	in.
Humus -	1	0
Stiff dirty clay, with flints and pebbles	3	0
Dirty gravel, with flints and pebbles -	2	3
Greyish coarse silicious sand and gravel	0	6
Coarser gravel and sand with quartzites and other pebbles	1	2
Grey marls ("skerries"), cuboidal, and apparently shattered -	2	3
Sandstone, with stains of vegetable matter - -	1	3
Grey and red marls - - -	20	0
Total depth - -	31	5

[The engineer's assistant states that a bed of flagstone in the lower part was so hard that it had to be blasted.]

The following sections numbered 1 to 20 are from information obtained during the making of sewers.

Communicated by Mr. Norman Scorgie.

(1) CHURCH GATE AND SANVEY GATE, NEAR THE CHURCH.—Sand and gravel, 11 feet. Red marl.

(2) SANVEY GATE.—Made ground from 8 to 15 feet. Marl.

(3) JUNCTION OF NORTHGATES AND SANVEY GATE.—Soil, etc., 9 feet. Gravel, 1 foot 6 inches. Marl.

(4) JUNCTION OF NORTHGATE LANE AND NORTHGATES.—Made ground, 12 feet. Marl.

(5) FRIARS ROAD (centre).—Made ground, 17 feet. Gravel.

(6) NORTHGATE STREET.—Made ground, 6 feet to 8 feet 6 inches.

(7) CHARLOTTE STREET.—Made ground, 10 feet. Gravel.

(8) ALEXANDER STREET.—Made ground, 10 feet. Gravel 2 feet. Marl.

(9) SARAH STREET, OPPOSITE RUDING STREET.—Made ground, 14 feet. Gravel.

(10) BATH LANE, OPPOSITE ORTON STREET.—Made ground, 16 feet. Marl.

(11) Bath Lane, 92 Feet South of Welles Street.

	Ft.	in.
Made ground	6	0
Concrete	5	6
Made ground (not bottomed)	9	6

(12) Bath Lane, Opposite Gonty's Dye Works.—Made ground, 18 feet. Marl.

(13) Friday Street, Corner of Watling Street.—Made ground, 6 feet 6 inches. Marl.

(14) Watling Street.—Made ground, 6 feet. Marl.

(15) All Saints' Road.—Made ground, 10 feet or more.

(16) Abbey Gate, Opposite Emerald Street.

	Ft.	in.
Made ground	0	9
Gravel	11	3
Marl	7	0
	19	0

(17) Littleton Street.

	Ft.	in.
Soil, etc.	8	0
Gravel	1	6
Marl.		

(18) Wood Gate.—Made ground, 8 feet. Marl.

(19) First Field South of Wood Gate.

	Ft.	in.
Soil	1	0
Gravel	4 feet to 10	0
Marl and blue shale	5 feet to 8	0

(20) Second Field South of Wood Gate, Near the Railway.

	Ft.	in.
Soil	1	0
Gravel	10	0
Blue shale	3	6
Rock	1	6

The following communicated by Mr. Smith.

Beaumont Leys.—Well 100 feet. Blue clay 97 feet into gravel. Plenty of water.

Beaumont Leys. Farm Nearest Anstey and Farm Nearest Gilroes Reservoir.—Blue clay 15 feet and 27 feet respectively. No water in either.

Mowmacre Cottage.—Blue clay, yellow in upper part, 9 or 10 yards. Not much water.

Ingarsby.

Railway Station.

Communicated by J. L. Pattison, 1882, per Mr. W. Whitaker.

———	Thickness.		Depth.	
	Ft.	in.	Ft.	in.
Made ground	3	0	3	0
Blue clay and sandstone	4	0	7	0
Blue clay and stone	12	0	19	0
Sand and blue clay	1	0	20	0
Blue clay and limestone	4	0	24	0
Sand -	1	0	25	0
Blue clay and stones	69	0	94	0
Hard blue Lias stone	2	0	96	0
Blue clay and stone	13	0	109	0
Clay stones and pebbles	6	0	115	0

Stationmaster reports this is a well 50 feet and boring 50 feet. No water obtained. Have to use rain water.

Billesdon Coplow.

Abstract of account of boring by J. Holdsworth, *Phil. Mag.*, Ser. III., Vol. III., p. 77*:—

	Ft.	in.
Strong slaty bind, containing about 9 feet of excellent ironstone in beds from 3 inches to 10 inches thick	150	0
Dun marl or bands of freestone, alternating in layers from 1 inch to 3 inches thick -	30	0
Grey rock - - - - - - -	27	0
Hard grey or freestone bands, divided by thin bands of light blue and black shale, with two thin veins of coal†	120	0
Hard bastard dun, much impregnated with coaly matter	42	0
Very hard striped rock -	2	6
Red dun, or, rather, shale - - - - -	9	0
Rock beautifully striped with black, white, brown, and dun - - - - - - -	21	0
Brown dun - - - -	18	0
Strong black shale, occasionally finely striped with white -	–	–
[? Total depth - - - - - - -	419	6]

Billesdon.

Near the Brook, Below Frisby (boring).

Sunk and communicated by Messrs. Thomson Bros. Sunk in 1897.

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*There is a criticism of this account by Conybeare, *Phil. Mag.*, Ser. III., Vol. III., p. 112, and a counter reply by Holdsworth, *Mag. Nat. Hist.*, Vol. VII., p. 42.

† The coal was obtained from washings of the material brought up, and is probably fossil wood or jet from the Lias.

——	Thickness.		Depth.	
	Ft.	in.	Ft.	in.
Surface soil	3	0	3	0
Clay and stones	16	0	19	0
Lias (weathered)	125	0	144	0
Lias (firm) [*Am. Bonnardi* at 240 feet.]	348	0	492	0
Lias with thin limestone beds	114	0	606	0
Lias, dark (no lime)	33	0	639	0
White limey sandstone [Effervesces strongly]	9	0	648	0
Light fireclay	3	0	651	0
Dark and broken fakes [shaly sandstone]	10	0	661	0
Brown dun [clay]	12	0	673	0
Dark fakes and blaes [shale]	38	0	711	0
Dark shaly blaes [with *Avicula contorta ?*]	5	0	716	0
Blue marl	15	0	731	0
Marly sandstone with thin gypsum beds	238	0	969	0

The following six sections are communicated by Mr. Preston, Wellsinker.

Asfordby.

(1) VILLAGE.—Blue dicey clay, 30 feet.

(2) HOLWELL IRONWORKS.—35 yards, all clay.

(3) RAILWAY STATION.—Gravel 5 feet.

Kirby Bellars.

(4) THE HALL.—Clay 9 yards, then sand.

Syston.

(5) RAILWAY PUMPING STATION.—Sand and gravel 6 yards; clay 4 yards.

Rearsby.

(6) VILLAGE.—Shallow wells in sand.

Seagrave.

LODGE FARM.

Information from Wellsinker.	Feet.
Chalky Boulder-clay, rather darker, with less chalk towards the bottom	46
Band of limestone 4 inches thick at	102
" " 7 " "	105
" " 9 " "	108
Nodular band, with water, at	114

Total depth of well, 40 yards.

Wells in the village are reported to have from 12 to 15 feet of chalky (?) Boulder-clay, with seven or eight floors of limestone below. Total depth, about 20 yards.

The following six sections communicated by Pick and Wells, Wellsinkers.

Queniborough.

(1) THE COPPICE.—Marl free of stones.

Barkby.

(2.) East Side.—Heavy soil, no springs, badly off for water.

(3.) West Side.—Lighter soil.

(4.) Barkby Thorpe.—Sand 3 yards; plenty of water.

(5.) New York Farm.—Black shale, 52 yards.

Beeby.

(6.) Near Beeby House.—Black shale.

Beeby.

Midland Brewery Company.

Sunk and communicated by Messrs. Isler and Co.

——	Thickness.		Depth.	
	Ft.	in.	Ft.	in.
Dug well	27	0	–	–
Blue Lias with stone	91	0	118	0
Rock and blue Lias	5	0	123	0
Blue Lias	17	0	140	0
Hard rock	2	0	142	0
Blue Lias	33	0	175	0
Rock	4	0	179	0
Black shale	8	0	187	0
Red marl	5	0	192	0
Red marl with gypsum	6	0	198	0
Red marl	5	0	203	0
Red marl and shale	5	0	208	0
Red and blue marl	50	0	258	0
Rock	4	0	262	0
Rock and red marl	3	0	265	0
Hard rock	2	0	267	0
Red and blue marl	3	0	270	0
Red marl and rock	15	0	285	0
Hard red marl	6	0	291	0
Hard rock	1	0	292	0
Hard red marl	16	6	308	6
[Omitted]	66	6	–	–
Hard rock	2	0	375	0
Hard red marl	15	10	390	10

Hoby.

Communicated by Mr. Shelton, Wellsinker.

Wells in the village generally.

Soil and loamy mixture, 4 feet.
Sand and sharp gravel, 9 feet or more.
Blue stone, solid.
Yellow clay.

Some wells in clay and gravel. In red clay at Hill House.

Frisby on the Wreak.

Communicated by Mr. Shelton.

PUBLIC HOUSE.—All quicksand.

The following three sections communicated by Mr. Smith, Wellsinker.

Swithland.

WOOD FARM (on west side of wood).—Red marl 36 feet on to slate.

Groby.

NEAR THE SCHOOL.—36 to 50 feet into sand. Plenty of water.

Glenfield.

LAND SOCIETY.—Deepest well about 60 feet. Blue and red clay 50 feet. sand below.

Anstey.

PAPERMILL COMPANY. [North side of the village] 225 feet above O.D.

B. A. Reports, 1875, p. 137.
Shaft, 102 feet; diameter, 8 feet; bore, 85 feet; diameter 3 inches.
No water; bottom of bore in gypsum.

	Ft.	in.
Drift, stiff brown Boulder-clay with rounded pebbles [with lumps of black clay (shale) and pyrites] - -	70	0
Red marl with layers of gypsum (6 inches to 12 inches) and white and blue clay (*dicey*). [Another account gives 80 feet red marl and 10 feet skerry] - -	117	0
Total depth	187	0

The boring ceased at a bed of gypsum so dry that a match could be ignited at the bottom.

Ratcliffe.

COLLEGE, Quadrangle of. Sunk in 1843. 312 feet above O.D.

B.A. Reports, 1878, p. 387.
Well 156 feet, diameter 6 feet.
Water stands at 8 feet.

[There is no detailed section given, but the nature of the rock is stated to be "Lower Lias and Upper Keuper Marls and sandstone." This is erroneous, as shown by information obtained by the college authorities in 1893, and kindly communicated to us per the Rev. J. Cappella. In this year the well was repaired, and samples of the strata taken at about every 11 feet, with the following result:—

		Feet.
Clayey sand with small pebbles and specks of chalk	at	11
Clayeysand with small pebbles and specks or rather coarser	,,	33
Grey clay, probably dark when wet	,,	44
Gritty sand with clayey partings and small stones	,,	55
Grey (blue) clay with sandstone, chert, etc.	,,	66
Grey (blue) clay with chalk, etc.	,,	77
Coarse sand with fragments, little marl -	,,	88
Red marl with a grey patch	,,	99
White quartzóse sandstone	,,	102
Red marl streaked with grey	,,	110
Red sandy marl with grey specks	,,	121

From the above it will be seen that there is no Lias or Rhætic in this well, as stated in the Report, but that the strata passed through might be correlated according to the following summary.

	Ft.	in.
Boulder-clay with a parting of sand, and possibly a bed of sand at the base -	88	0
Red marl with a bed of sandstone, probably the same as that which crops out in the village -	68	0
Total depth	156	0

Mr. G. Hodson states that this well, which was 139 feet deep, was continued by boring to 241 feet; the Waterstones being reached at 220 feet.

Glen Parva.

New Barracks. About 300 feet above o.d.

B.A. Reports, 1878, p. 387.

Shaft 100 feet, diameter 6 feet; bore 150 feet, diameter 6 inches.

Very little water, hard what there is, and that is thought to be surface drainage.

	Ft.	in.
Drift - - -	10	0
Lower Lias with thin limestone	40	0
Rhætic [mostly tea-green marl] -	20	0
Chocolate marls -	30	0
Red marls, chocolate colour -	150	0
	250	0

Blaby.

Hospital about a Mile S.E. of the Village.

Communicated by Messrs. Simpson and Harvey.

Two wells, the one at the top of the field about 90 feet deep, one at the side about 35 feet deep.

	Ft.	in.
Soil - -	0	6
Brick clay - - -	20	0
Bluish clay - - - - - - - -	70	0 ?

A vein or pocket of sand at the 35 feet depth.

Countesthorpe.

BORING AT THE COTTAGE HOMES.

Communicated by Messrs. Le Grand and Sutcliff. Sunk in June, 1892.

——	Thickness.		Depth.	
	Ft.	in.	Ft.	in.
Well [Drift 87 feet]	103	0	–	–
Red marl	28	0	131	0
Red marl and gypsum	6	6	137	6
Marl and gypsum	41	6	179	0
Sandstone	1	2	180	2
Blue and red marl	9	10	190	0
Slate and blue marl [skerry]	6	6	196	6
Blue and red marl	3	6	200	0
Red marl and gypsum	102	0	302	0
Red marl	43	6	345	6
Sandstone	3	0	348	6
Red marl	8	6	357	0
Sandstone	0	3	357	3
Red marl rock	4	3	361	6
Red marl rock	31	4	392	10
Hard rock	0	6	393	4
Red marl	83	2	476	6
Rock	0	6	477	0
Red marl	72	0	549	0
Blue marl rock	2	6	551	6
Red marl	46	6	598	0
Red and blue marl and red sandstone	2	6	600	6
Red marl	4	0	604	6
Red sandstone	10	0	614	6
Marl and blue sandstone	8	0	622	6
Red marl	4	3	626	9
Granite*	2	9	629	6
Red marl	3	6	633	0
Granite	4	8	637	8

No supply of water.

Melton Mowbray.

Boring for town supply about 200 yards west of G.N.R. and L.N.W.R. joint station. About 260 feet above O.D.†

	Ft.	in.
Loam and gravel	14	0
Boulder-clay (?)	24	0
Lower Lias	230	8
Rhætic (dark shaly clay and stone)	16	4
Keuper Marl (Red and grey marls with bands of gypsum and bands of grey sandstone in the lower part)	247	10
	532	10

Water rises to 120 feet below the surface, from the gypsum beds as well as the sandstone.

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* This is probably a similar rock to that described on p. 116.

† Details of this section are given in the Survey Memoir descriptive of Sheet 70. "The Geology of the South-west Part of Lincolnshire," p. 147.

Saxby.

Trustees of the late Earl of Dysart. Situated near the river, and half-way between north and south of enclosure No. 89, or 2,500 Plan No. XX. 8 of Leicestershire.

——	Thickness.		Depth.	
	Ft.	in.	Ft.	in.
Soil and blue clay	14	0	–	–
Nodular limestone rock	2	6	16	6
Blue clay	31	0	47	6
Rock	2	0	49	6
Blue clay	76	0	125	6
Rock (small supply of water from this rock)	7	6	133	0
Clay	92	0	225	0
Rock (water found here)	4	6	229	6
Clay and soft rock	2	0	231	6
Rock	8	6	240	0
Clay	36	6	276	6
Rock (a little more water found in this rock)	5	0	281	6
Clay	16	6	298	0
Rock	4	0	302	0
Clay	7	6	309	6

Oakham.

One mile west of the town. About 350 feet above O.D.

B.A. Reports, 1879, p. 161.
Sunk about five years before, and deepened several times.
Shaft 80 feet. Diameter 7 feet. No driftways.

Water stands at about 40 feet level, not perceptibly reduced.
Very sweet and pleasant water, used solely for brewing.

	Ft.	in.
Drift	4	0
Upper Lias clay	30	0
Marlstone rock	18	0
„ sands	28	0
	80	0

APPENDIX II.

CATALOGUE OF FOSSILS

RECORDED FROM THE

TRIAS, RHÆTIC AND LIAS FORMATIONS OF LEICESTERSHIRE AND RUTLAND, OR JUST BEYOND THE BORDERS OF THOSE COUNTIES.

This Catalogue of the Trias, Rhætic, and Lias Fossils of Leicestershire and the immediate neighbourhood has been compiled from the works of the different authors enumerated in the list given below.

The narrow columns give the horizon at which the species has been recorded, the several observations being noted by an initial. When the reference is not sufficiently explicit to determine at what particular zone the species occurs, the observation is entered in one of three columns denoting the general divisions of the Lias.

The names of species are printed in three forms of type: those now recognized being in **Clarendon** characters, the synonyms of these in *italics*; while the uncertain and doubtfully determined forms, as well as the MS. names of species which have not as yet been figured or described, are placed in SMALL CAPITALS.

Reference Initial.	Author or Museum.	Works referred to.
A.	D. T. Ansted.	Physical Geography and Geology of the County of Leicester, 1866.
B.	Montagu Browne.	The Vertebrates of Leicestershire, 1889. Leicester Lit. Phil. Soc. for 1893, p. 123. Brit. Assoc. Rep. for 1895.
Ba.	E. F. Bates and L. Hodges.	Rhætics at Spinney Hills, Leicester Lit. Phil. Soc. for 1886, p. 22.
Bm.	British Museum.	
J.	J. W. Judd.	Geology of Rutland. Geological Survey Memoir, 1875.
Jm.	Jermyn Street Museum.	
H.	W. H. Hudleston and E. Wilson.	Catalogue of British Jurassic Gasteropoda 1892.
Ho.	W. J. Harrison.	Quart. Journ. Geol. Soc., vol. xxxii., p. 212, 1876. Geology of Leicestershire and Rutland, 1877.
L.	Leicester Museum.	
M.	J. Morris.	Catalogue of British Fossils, 1854.
N.	A. J. Jukes-Browne, and others.	Geology of South-west part of Lincolnshire, with parts of Leicestershire and Nottinghamshire (Explanation of Sheet 70). Geol. Survey Memoir, 1885.
P.	J. D. Paul.	Section on the Gt. Northern Railway near Thurnby. Leicester Lit. Phil. Soc., 1883, p. 50.
Pl.	James Plant.	Leicester Lit. Phil. Soc. for 1875, p. 43. Quart. Journ. Geol. Soc. 1856, p. 369.
Q.	H. E. Quilter.	Leicester Lit. Phil. Soc. for 1883, p. 51, and 1884, p. 86. The Lower Lias of Leicestershire, Geol. Mag., dec. iii., vol. iii., p. 59, 1886.
S.	Geological Survey.	Collected and determined by the officers of the Survey.
W.	E. Wilson and H. E. Quilter.	The Rhætic Section at Wigston. Geol. Mag., dec. iii., vol. i., p. 415, 1884.
	E. Wilson.	British Liassic Gasteropoda. Geol. Mag., dec. iii., vol. iv., p. 193, etc. 1887.
	E. Wilson and W. D. Crick.	The Lias Marlstone of Tilton. Geol. Mag., dec. iii., vol. vi., p. 296, etc. 1889. The List given by E. Wilson in Mid. Nat. 1885, differs from this, but we take the later one as being the most correct.
Wo.	A. S. Woodward and C. D. Sherborn	Catalogue of British Fossil Vertebrata, 1890.
X.	Various authors.	Reference given in last column.

SPECIES.			Lower.								Middle.		Upper.						LOCALITIES AND REMARKS.
	Keuper Sandstone.	Rhætic Beds.	Am. planorbis.	Am. angulatus.	Am. Bucklandi.	Am. semicostatus.	Am. oxynotus.	Am. armatus.	Am. Jamesoni.	Am. capricornus.	Am. margaritatus.	Am. spinatus.	Am. annulatus.	Am. serpentinus.	Am. communis.	Lower Lias.	Middle Lias.	Upper Lias.	
INCERTÆ SEDIS.																			
Onychites sp. Wilson, Geol. Mag. 1889, pl.x., fig 6.	-	-	-	-	-	-	-	-	-	-	-	W	-	-	-	-	-	-	Tilton East) Norton).
PLANTÆ.																			
ALGÆ ?	Pl	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Leicester.
Echinostachys oblongus ? Brongn.	Pl Hn	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Leicester.
Equisetites sp.	Pl	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Leicester.
FOSSIL WOOD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	L	L		
FUCOIDS	-	L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Crown Hill
PLANT REMAINS	L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	L	-	-	
Pterophyllum brevipenna ? Heer	-	B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	East Leake.
Voltzia sp.	Pl Un	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Leicester. Cast of leaves in red marl (Harrison).
FORAMINIFERA.																			
Cornuspira infima, Strickland	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	H. B. Woodward, Jurassic Rocks of Britain, Vol. iii.
sp.	-	-	-	-	-	-	Q	-	-	-	-	-	-	-	-	-	-	-	Old Dalby Tunnel. Foraminifera of these genera were obtained by E. Wilson.
Cristellaria sp.	-	-	-	-	-	-	Q	-	-	-	-	-	-	-	-	-	-	-	
Dentalina sp.	-	-	-	-	-	-	Q	-	-	-	-	-	-	-	-	-	-	-	
Frondicularia sp.	-	-	-	-	-	-	Q	-	-	-	-	-	-	-	-	-	-	-	
Involutina sp.	-	-	-	-	-	-	Q	-	-	-	-	-	-	-	-	-	-	-	
Lingulina sp.	-	-	-	-	-	-	Q	-	-	-	-	-	-	-	-	-	-	-	
Marginulina sp.	-	-	-	-	-	-	Q	-	-	-	-	-	-	-	-	-	-	-	
Miliola sp.	-	-	-	-	-	-	Q	-	-	-	-	-	-	-	-	-	-	-	
Nodosaria sp.	-	-	-	-	-	-	Q	-	-	-	-	-	-	-	-	-	-	-	
Nonionina sp.	-	-	-	-	-	-	Q	-	-	-	-	-	-	-	-	-	-	-	
Orbulina sp.	-	-	-	-	-	-	Q	-	-	-	-	-	-	-	-	-	-	-	
Planularia sp.	-	-	-	-	-	-	Q	-	-	-	-	-	-	-	-	-	-	-	
Pulvinulina sp.	-	-	-	-	-	-	Q	-	-	-	-	-	-	-	-	-	-	-	
Textularia sp.	-	-	-	-	-	-	Q	-	-	-	-	-	-	-	-	-	-	-	
CŒLENTERATA. (ACTINOZOA.)																			
GORGONIA KEUPERI, Plant	Pl	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Probably not organic.
Lepidophyllia hebridensis, Dunc.	-	-	-	-	-	N Q	-	-	-	-	-	-	-	-	-	-	-	-	Redmile.
Montlivaltia Guettardi, Blainv.	-	-	-	N	Q	-	-	-	-	-	-	-	-	-	-	L	-	-	Bottesford, Kilby.

SPECIES.	Keuper Sandstone.	Rhætic Beds.	Lower.								Middle.		Upper.			Lower Lias.	Middle Lias.	Upper Lias.	LOCALITIES AND REMARKS
			Am. planorbis.	Am. angulatus.	Am. Bucklandi.	Am. semicostatus	Am. oxynotus.	Am. armatus.	Am. Jamesoni.	Am. capricornus.	Am. margaritatus.	Am. spinatus.	Am. annulatus.	Am. serpentinus.	Am. communis.				
Haimei, Chap. & Dew.	–	–	N	–	–	–	–	–	–	–	–	–	–	–	–	L	–	–	Balderton, Old Dalby.
mucronata, Dunc.	–	–	–	–	–	–	Q	–	–	–	–	–	–	–	–	–	–	–	
papillata, Dunc.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	X	–	–	Gainsborough. Duncan, Pal. Soc.
rugosa, Wright	–	–	–	N	–	–	–	–	J	–	–	–	–	–	–	–	–	–	Claypole, Dalby.
Thecocyathus sp.	–	–	–	–	–	–	–	–	–	–	–	W	–	–	–	–	–	–	Tilton.
ECHINODERMATA. (ECHINOIDEA.)																			
Cidaris **Edwardsi**, Wright	–	–	Ba W	–	Q	–	Q?	–	–	–	–	–	–	–	–	B L	–	–	Spinney Hills, Wigston.
spp.	–	–	–	–	Q?	–	–	–	–	–	–	–	–	–	–	L	–	–	Barrow. Crown Hill. *C. florigemma*, recorded by Quilter in error? Omitted in list of 1886.
Eodiadema **granulata**, Wilson	–	–	–	–	–	–	–	–	–	–	–	W	–	–	–	–	–	–	Tilton.
Hemipedina **Tomesi**, Wright	–	–	Q	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Thurnby.
(spines)	–	–	–	–	P	–	–	–	–	–	–	–	–	–	–	B L	–	–	Barrow.
OPHIUROIDEA.																			
Ophioderma **Milleri**, Phil.	–	–	–	–	–	–	–	–	–	–	N	–	–	–	–	–	–	–	Middle Gonerby.
Ophiolepis **Damesi**, Wright	–	L W Hn	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Wigston. Spinney Hills.
Ramsayi? Wright	–	Q L	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Disc and ray.
CRINOIDEA.																			
Extracrinus **britannicus**, Schloth.; *Pentacrinus briareus*, Miller	–	–	–	–	Q	–	–	–	N?	N?	–	–	–	–	–	Hn	–	–	Crown Hill, Barrow, Kilby Bridge.
subangularis, Miller	–	–	–	–	–	–	–	–	–	–	J	–	–	–	–	–	–	–	
Pentacrinus **basaltiformis**, Miller	–	–	–	–	–	–	–	–	–	J	–	–	–	–	–	–	–	–	Market Harbro
briareus, Miller v. Extracrinus britannicus.																			
lævis, Miller	–	–	–	–	–	–	–	–	–	–	–	W J	–	–	–	–	–	–	Tilton.
psilonoti, Quenst.	–	–	W Q	–	Q	–	–	–	–	–	–	–	–	–	–	–	–	–	Wigston.
punctiferous, Quenst. v. P. scalaris.																			
robustus, Wright	–	–	–	–	–	–	–	–	–	Q J	–	–	–	–	–	–	–	–	
scalaris, Goldf.; *P. punctiferous*, Quenst.	–	–	–	–	–	–	–	–	J S Q	–	–	–	–	–	–	–	–	–	Stapleford. Loseby.
subangularis, Miller, v. Extracrinus.																			
spp.	–	–	Ba	–	P	N	–	–	S	N	J	–	–	–	–	–	–	–	

SPECIES.	Keuper Sandstone.	Rhætic Beds.	Lower.								Middle.		Upper.			Lower Lias.	Middle Lias.	Upper Lias.	LOCALITIES AND REMARKS.
			Am. planorbis.	Am. angulatus.	Am. Bucklandi.	Am. semicostatus	Am. oxynotus.	Am. armatus.	Am. Jamesoni.	Am. capricornus.	Am. margaritatus.	Am. spinatus.	Am. annulatus.	Am. serpentinus.	Am. communis.				
ANNELIDA.																			
Ditrupa capitata, Phil. (*Serpula*).	-	-	-	-	-	N Q	-	-	-	-	-	W	-	-	-	-	-	-	Tilton, Redmile.
etalensis, Piette	-	-	-	-	-	-	-	-	-	-	-	W	-	-	-	L	-	-	Tilton, Old Dalby.
quinquesulcata, Münster	-	-	-	-	-	-	-	-	-	-	-	W J	-	-	-	-	-	-	Tilton.
sp.	-	-	-	-	-	-	-	-	N	-	-	-	-	-	-	-	-	-	
Serpula *capitata*, Phil. v. Ditrupa.																			
tetragona, Desl.	-	-	-	-	-	-	-	-	-	-	-	W	-	-	-	-	-	-	Tilton. Geol. Mag. 1889, p 342. ? *S. tetragona*, Sow. Unable to verify this.
tricristata, Goldf.	-	-	-	-	-	-	-	-	-	-	-	W?	-	-	W	-	-	-	Tilton.
spp.	-	-	W Q	-	P Q	S	Q	Q	J Q	S	-	-	-	-	-	-	-		
WORM-TRACKS	Pl Hn	Hn	-	-	-	-	-	-	-	-	-	-	-	-	-	-	L	-	
INSECTA.																			
Buprestis (Elytron of)	-	-	Q	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Libellula (Wing of)	-	-	Q	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
INSECT WING	Hn	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Spinney Hills. In the tea-green marl.
NEUROPTEROUS INSECT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	L	-	-	Barrow.
Palæotermes Ellisi, Woodw.; Geol. Mag., 1892, p. 193.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	L	-	-	Barrow. Type specimen.
BRYOZOA.																			
Diastopora oolitica, Vine	-	-	-	-	-	-	-	-	-	-	-	W	-	-	-	-	-	-	Tilton.
stomatoporoides ? Vine.	-	-	-	-	-	-	-	-	-	-	-	W	-	-	-	-	-	-	Tilton.
CRUSTACEA.																			
Archæoniscus sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	L	-	-	Barrow.
CRUSTACEAN REMAINS	-	-	-	-	-	-	Q	-	-	-	-	-	-	-	-	-	-	-	
Eryma n.sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	L	-	-	Fleckney. *Fide*. Dr. H Woodward.
Eryon barrovensis, M'Coy	-	-	Hn Q	-	-	-	-	-	-	-	-	-	-	-	-	L	-	-	Barrow.
sp.	-	-	-	-	Q	-	-	-	-	-	-	-	-	-	-	-	-	-	
Estheria minuta, Goldf.	Pl Hn R	N Hn			-	-	-	-	-	-	-	-	-	-	-	-	-	-	Kilvington, Casts in nodular limestone. Spinney Hills, Dane Hills. Aylestone.
sp.	L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Glyphæa liassina ? Meyer	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	Barrow. ?=*G. liassica*, recorded by Brodie, Ann. Mag. Nat. Hist., 1867, ser. 3, vol. xix,. p. 31.

SPECIES.	Keuper Sandstone.	Rhætic Beds.	Lower.								Middle.		Upper.			Lower Lias.	Middle Lias.	Upper Lias.	LOCALITIES AND REMARKS.
			Am. planorbis.	Am. angulatus.	Am. Bucklandi.	Am. semicostatus.	Am. oxynotus.	Am. armatus.	Am. Jamesoni.	Am. capricornus.	Am. margaritatus.	Am. spinatus.	Am. annulatus.	Am. serpentinus.	Am. communis.				
Præatya																			
scabrosa, Woodward, Geol. Mag., 1878, p. 289.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Bm	–	–	Barrow.
BRACHIOPODA.																			
Discina																			
reflexa, Sow. -	–	–	–	–	–	–	–	–	–	–	–	W	–	–	J N	–	–	–	Tiltnn. Grantham.
Lingula																			
metensis, Terq. -	–	–	–	–	–	–	–	–	N	–	–	–	–	–	–	–	–	–	Broughton.
Rhynchonella																			
acuta, Sow. var. **bidens**, Phil.	–	–	–	–	–	–	–	–	–	–	–	W J	–	–	–	–	–	–	Tilton.
amalthei, Quenst. -	–	–	–	–	–	–	–	–	–	–	–	W	–	–	–	–	–	–	Tilton.
calcicosta, Quenst.	–	–	–	–	P Q	–	Q	S Q	–	–	–	–	–	–	–	–	–	–	Crown Hill, Thurnby, Ingarsby.
fodinalis, Tate -	–	–	–	–	–	–	–	–	–	–	–	W N S	–	–	–	–	–	–	Tilton. Wellingore.
lineata, Y. & B. -	–	–	–	–	–	–	–	–	–	S	–	–	–	–	–	–	–	–	Billesdon.
plicatissima, Quenst. v. Rh. calcicosta.																			
tetrahedra, Sow. -	–	–	–	–	–	–	Q	–	N S	S	J	W H J N	–	–	–	L	L	–	Old Dalby, Holywell, Tilton, Hallaton, Edmondthorpe, Pickwell, Ingarsby, Loseby.
tetrahedra, var. **northamptonensis**, Dav.	–	–	–	–	–	–	–	–	–	–	–	W N	–	–	–	–	Hn L	–	Tilton, Holywell, Eastwell.
variabilis, Schloth.	–	–	–	–	–	N Q	–	–	J	–	–	–	–	–	–	Hn L	L	–	Barrow, Kilby, Thorpe Langton, Loseby, Redmile.
subvariabilis, Dav.	–	–	–	–	–	N	–	–	–	–	–	–	–	–	–	–	–	–	Plungar.
spp. - - - -	–	–	–	–	–	–	–	–	N	N S	–	–	–	–	–	L	–	–	Old Dalby Loseby.
Spiriferina																			
rostrata, Schloth. -	–	–	–	–	–	–	–	–	–	–	–	W	–	–	–	–	–	–	Tilton.
verrucosa, Von Buch	–	–	–	–	–	–	Q	–	–	–	–	–	–	–	–	L	–	–	Old Dalby.
Walcotti, Sow. -	–	–	–	–	–	N	Q	–	J Q	–	–	–	–	–	–	L	–	–	Thorpe Langton, Loseby, Old Dalby.
Terebratula																			
furcillata, Theod. var. **lævigata**, Quenst.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	L	–	–	Old Dalby.
punctata, Sow. -	–	–	–	–	–	Q? N	–	–	–	–	J	Hn W J N	–	–	–	–	L S	–	Holywell, Edmondthorpe, Pickwell, Keythorpe, Tilton, Skeffingtnn.
punctata, var. **Edwardsi**, Dav.	–	–	–	–	–	–	–	–	–	–	–	W	–	–	–	–	L	–	Tilton, Belvnir.
punctata, var. **haresfieldensis**, Dav.	–	–	–	–	–	–	–	–	–	–	–	W	–	–	–	–	L	–	Tilton.
punctata, var. **radstockensis**, Dav.	–	–	–	–	–	–	–	–	–	–	–	W	–	–	–	–	L	–	Tilton,Holwell.
subpunctata, Dav.	–	–	–	–	–	–	–	–	–	–	–	N	–	–	–	–	L	–	Tilton,Holwell.
Walfordi, Dav. -	–	–	–	–	–	–	–	–	–	–	–	W	–	–	–	–	–	–	Tilton.
spp. - - - -	–	–	–	–	–	–	–	–	–	S	–	–	–	–	–	–	–	Q	Market Harbro'.
Waldheimia																			
indentata, Sow. -	–	–	–	–	–	–	–	–	–	–	–	W	–	–	–	–	–	–	Tilton.
numismalis, Lam.	–	–	–	–	–	–	Q	–	–	–	–	W J	–	–	–	L	–	–	Tilton, Edmondthorpe, Old Dalby.

SPECIES.	Keuper Sandstone.	Rhætic Beds.	Lower.								Middle.		Upper.			Lower Lias.	Middle Lias.	Upper Lias.	LOCALITIES AND REMARKS.
			Am. planorbis.	Am. angulatus.	Am. Bucklandi.	Am. semicostatus	Am. oxynotus.	Am. armatus.	Am. Jamesoni.	Am. capricornus.	Am. margaritatus.	Am. spinatus.	Am. annulatus.	Am. serpentinus.	Am. communis.				
perforata, Piette	–	–	–	–	Q	–	–	Q	N	–	–	–	–	–	–	L	–	–	Old Dalby, Kilby Bridge, Loseby, Woolethorpe.
resupinata, Sow.	–	–	–	–	–	–	–	–	–	–	–	W	–	–	–	–	–	–	Tilton.
subnumismalis, Dav.	–	–		–	–	–	–	–	–	–	–	W	–	–	–	–	–	–	Tilton.
Waterhousi, Dav.	–	–	–	–	–	–	–	–	–	–	–	N	–	–	–	–	–	–	Wellingore
LAMELLIBRANCHIATA. (MONOMYARIA.)																			
Anomia																			
numismalis, Quenst.	–	–	–	–	–	–	–	–	–	–	–	W	–	–	–	–	–	–	Tilton.
Avicula (*Cassianella*)																			
contorta, Portl.	–	L W N B Hn	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Barrow. Wigston. East Leake.
cygnipes, Y. and B	–	–	N	–	–	–	–	Q	–	–	W J	–	–	–	–	–	L	–	Tilton, Harbro. Hallaton, Cranhoe.
decussata, Goldf. v. Pseudomonotis																			
inæquivalvis, Sow.	–	–	–	–	–	N	–	–	S	–	W J N S	W N	–	–	–	–	L	–	Tilton, Belton, Ouston, Harbro, Hallaton, Holt, Loseby.
novemcostæ, Brown v. Av. inæquivalvis																			
papyria, Quenst.	–	–	–	S	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Thurnby. From a well.
spp.	–	–	–	–	–	–	–	–	N S	N S	–	–	–	–	–	L	–	–	Ashby Folville.
Cassianella v. Avicula																			
Crenatula v. Inoceramus																			
Gervillia																			
spp.	–	–	–	–	P?	N	–	–	–	–	–	–	–	–	–	–	–	–	Thurnby, Plungar.
Gryphæa																			
arcuata, Lam.; *G. incurva*, Sow.	–	–	W Q	– Q	P Q N	N Q Hn	Q	N Q	S	N	–	–	–	–	–	Hn	–	–	Abundant.
cymbium, Lam.	–	–	–	–	–	–	Q	J	J S Q N	S N	–	–	–	–	–	S L	–	–	Abundant.
cymbium, Lam. var. **depressa**, Phil.	–	–	–	–	–	–	–	S	–	–	W	–	–	–	–	–	–	–	Loseby, Tilton.
cymbium, Lam., var. **obliquata**, Sow.	–	–	–	–	–	–	–	J	J Q	–	–	–	–	–	–	–	–	–	Loseby, Dalby, Staunton Wyville.
incurva, Sow. v. G. arcuata.																			
Maccullochi, Sow. G. cymbium.																			
obliquata, Sow. v. G. cymbium.																			
sp.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	L	–	–	Barrow.
Hinnites																			
abjectus, Phil.	–	–	–	–	–	–	–	–	–	–	–	W J	–	–	–	–	–	–	Tilton.
tumidus, Ziet.; *P. velatus*, Münst.	–	–	–	–	–	–	–	–	–	–	–	W S N	–	–	–	–	–	–	Tilton.
velatus, Münst. v. H. tumidus.																			
Inoceramus																			
dubius, Sow.	–	–	N	–	–	–	–	–	N ?	N	–	–	J	–	W J	–	–	J	Barrowby, Keythorpe, Rockingham.
substriatus, Münst.	–	–	–	–	–	–	–	–	J	–	–	–	–	–	–	–	L	–	Eastwell.

SPECIES.	Keuper Sandstone.	Rhætic Beds.	Lower.								Middle.		Upper.			Lower Lias.	Middle Lias.	Upper Lias.	LOCALITIES AND REMARKS.
			Am. planorbis.	Am. angulatus.	Am. Bucklandi.	Am. semicostatus.	Am. oxynotus.	Am. armatus.	Am. Jamesoni.	Am. capricornus.	Am. margaritatus.	Am. spinatus.	Am. annulatus.	Am. serpentinus.	Am. communis.				
ventricosus, Sow. (*Crenatula*).	-	-	-	-	-	-	Q	-	-	J	-	-	-	-	-	L	-	-	Harbro, Old Dalby.
sp.; Geol. Mag., 1889, p. 388, pl. x., f. 4.	-	-	-	-	-	-	-	-	-	-	-	W	-	-	-	-	-	-	Tilton (East Norton).
sp.	-	-	-	-	-	N	-	-	-	-	-	-	-	-	-	-	-	-	Plungar.
Lima																			
acuticosta, Schloth. v. Limea.																			Error for Limea.
duplicata, Sow.	-	-	-	-	N	-	-	-	-	-	-	N?	-	-	-	-	-	-	Redmile, Eastwell.
eucharis, d'Orb.	-	-	-	-	-	-	-	-	-	-	-	W	-	-	-	-	-	-	Tilton.
gigantea, Sow.	-	-	W Ba N Q	Q	P Q	N Q	Q?	Q	S	N	-	-	-	-	-	Hn L	-	-	Abundant.
Hermanni, Voltz.	-	-	Q	-	-	-	-	J Q	J Q	-	-	W	-	-	-	Hn	-	-	Loseby, Barrow, Tilton, Stapleford.
pectinoides, Sow.	-	-	N Ba Q	-	P Q	N Q	Q	Q	S	-	J N	W J	-	-	-	S B L	Hn L	-	Cranhoe, Thurnby, Tilton, Spinney Hills, Billesdon, Rocart, Belton, Loseby, Twyford, Cold Newton.
punctata, Sow.	-	-	-	-	-	N Q	-	-	-	-	-	N	-	-	-	-	-	-	Redmile, Plungar, Wellingore.
succincta, Schloth.	-	-	Q	-	Q	-	-	-	-	-	-	-	-	-	-	L	-	-	Barrow, Hoton.
spp.	-	-	Ba	-	-	-	-	-	-	-	-	-	-	-	-	Hn L	-	-	Spinney Hills.
Limea																			
acuticosta, Münst.	-	-	-	-	-	-	-	-	J Q	-	-	W	-	-	-	L	-	-	Thorpe Langton, Stapleford, Tilton, Loseby, Kilby Bridge. *Lima* of Judd, and Quilter.
juliana, Dum.	-	-	-	-	-	-	-	-	-	-	-	W	-	-	-	-	-	-	Tilton.
sp.	-	-	-	-	Q	-	-	-	-	-	-	-	-	-	-	-	-	-	
Monotis v. Avicula and Pseudomonotis.																			
Ostrea																			
arcuata, Lam. v. Gryphæa.																			
cymbium, Lam. v. Gryphæa.																			
Goldfussi, Brown; *O. irregularis*, Münst.	-	-	N	-	-	-	-	Q	-	-	-	-	-	-	-	-	-	-	Cotham.
irregularis, Münst. v. O. Goldfussi.																			
liassica, Strickland	-	-	W N Ba	Q?	P Q	-	Q	Q?	-	Q	-	-	-	-	-	Q Hn L	-	-	Wigston, Kilby, Spinney Hills, Thurnby, Barrow, Fleckney.
submargaritacea, Brauns	-	-	-	-	-	-	-	-	-	-	-	W	-	-	-	-	-	-	Tilton.
spp.	-	-	Ba	-	-	N	-	-	N	N	N	J	-	-	J	L	-	-	Spinney Hills, Tilton, Allexton.
Pecten																			
acutiradiatus, Goldf.	-	-	-	-	-	-	-	-	-	-	-	W	-	-	-	-	-	-	Tilton.
æquivalvis, Sow.; *P. sublævis*, Y. & B	-	-	-	-	P	N Q	-	-	N J	-	J	W J N	-	-	-	-	L	-	Abundant.
calvus, Goldf.	-	-	-	-	-	-	-	-	-	-	-	W	-	-	-	L	-	-	Tilton, Loseby.
demissus, Phil.	-	-	-	-	-	-	-	-	-	-	J	-	-	-	-	-	-	-	Belton.
dentatus, Sow.	-	-	-	-	-	N	-	-	-	-	-	W J	-	-	-	-	-	-	Plungar, Tilton.

SPECIES.	Keuper Sandstone.	Rhætic Beds.	Lower.								Middle.		Upper.			Lower Lias.	Middle Lias.	Upper Lias.	LOCALITIES AND REMARKS.
			Am. planorbis.	Am. angulatus.	Am. Bucklandi.	Am. semicostatus.	Am. oxynotus.	Am. armatus.	Am. Jamesoni.	Am. capricornus.	Am. margaritatus.	Am. spinatus.	Am. annulatus.	Am. serpentinus.	Am. communis.				
liasianus, Nyst. v. P. lunularis.																			
lunularis, Roemer; *P. liasianus*, Nyst.	–	–	Q	–	Q P	N Q	–	–	S	N	J	W S J N	–	–	–	–	Hn L	–	Crown Hill, Tilton, Twyford, Bowden.
priscus, Schloth.	–	–	–	–	–	–	–	–	–	–	–	W	–	–	–	–	–	–	Tilton.
sublævis, Y. & B. v. P. æquivalvis.																			
textorius, Schloth.	–	–	–	–	–	N Q	–	–	–	N?	–	W	–	–	–	L	L	–	Tilton, Loseby, Grantham.
Thiollieri, Martin	–	–	–	–	–	N	–	–	S	–	–	–	–	–	–	L	–	–	Rocart, Ashby Folville, Loseby.
valoniensis, Defr.	–	L B Q	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	East Leake, Wigston.
spp.	–	–	Ba W	–	–	–	–	–	–	–	–	–	–	–	–	L	–	N	Spinney Hills, Market Harbro.
Perna																			
infraliasica, Quenst.	–	–	–	–	Q	–	–	–	–	–	–	–	–	–	–	–	–	–	
Pinna																			
fissa, Goldf.	–	–	–	–	–	N	–	–	–	–	N?	–	–	–	–	–	–	–	Plungar.
folium, Y. & B.	–	–	–	–	–	–	Q	Q	–	–	–	–	–	–	–	L	–	–	Old Dalby.
spathulata, Tate	–	–	–	N	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Redmile.
tiltonensis, Wilson	–	–	–	–	–	–	–	–	–	–	–	W	–	–	–	–	L	–	Tilton.
sp.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	L	–	–	Barrow.
Placunopsis																			
sp.	–	–	–	–	–	–	–	–	–	–	–	J	–	–	–	–	–	–	Tilton.
Plicatula																			
lævigata, d'Orb.	–	–	–	–	–	–	–	–	J? Q	–	–	–	–	–	–	–	–	–	Stapleford.
spinosa, Sow.	–	–	–	–	P Q	–	J Q	Q	J N S Q	N S	J	W	–	–	–	L	L	–	Thurnby, Freeby, Dalby, Stapleford, Tilton, Thorpe Langton, Cold Newton.
sp.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	L	–	–	Barrow.
Posidonomya																			
Bronni, Voltz	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	J N	Holt. Grantham
sp.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	N	Grantham.
Pseudomonotis																			
decussatus, Goldf. (*Avicula.*)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	L	–	–	
Pteroperna																			
sp.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	J	Allexton.
LAMELLIBRANCHIATA. (DIMYARIA.)																			
Anatina																			
præcursor, Quenst.	–	B	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	East Leake.
Arca																			
elongata, Buckm.	–	–	–	–	–	–	–	–	–	–	N	–	–	–	–	–	–	–	MiddleGonerby
ferruginea ? Lycett	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	N?	Grantham.
Stricklandi, Tate; *A. truncata*. Buckm.	–	–	–	–	–	–	–	–	–	S?	N	–	–	–	–	S	–	–	MiddleGonerby, Billesdon, BillesdonCoplow.
truncata, Buckm. v. A. Stricklandi																			
spp.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	J	L	–	–	Thornhaugh, Old Dalby.
Arcomya																			
elongata, Roem. (*Panopæa*).	–	–	–	–	–	–	–	–	J?	J	–	–	–	–	–	–	–	N	Grantham, Dalby, Loseby.
vetusta, Phil.	–	–	–	–	–	–	Q	–	–	–	–	–	–	–	–	–	–	–	
sp.	–		–	–	–	–	–	–	–	–	–	–	–	–	–	S	–	–	Twyford.
Astarte																			
striato-sulcata, Röm.	–	–	–	–	–	–	–	–	–	–	–	W	–	–	–	L	–	–	Tilton, Great Dalby, Loseby.
spp.	–	–	–	–	–	N	–	–	–	–	–	–	–	–	J N	B L	–	–	Rockingham, Holt, Allexton.

SPECIES.	Keuper Sandstone.	Rhætic Beds.	Lower								Middle.		Upper.			Lower Lias.	Middle Lias.	Upper Lias.	LOCALITIES AND REMARKS.
			Am. planorbis.	Am. angulatus.	Am. Bucklandi.	Am. semicostatus.	Am. oxynotus.	Am. armatus.	Am. Jamesoni.	Am. capricornus.	Am. margaritatus.	Am. spinatus.	Am. annulatus.	Am. serpentinus.	Am. communis.				
Axinus v. Schizodus.																			
Cardinia																			
antiqua, Phil.	-		-	-	-	-	-	-	-	-	-	-	-	-	-	S?	-	-	Loseby.
attenuata, Stutchb.	-	-	-	-	-	N	-	-	J	-	-	-	-	-	-	-	-	-	Staunton Wyvile, Dalby.
CARDIOIDES, v. Unicardium.	-	-	-	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-	Thurnby. Probably misprint for Unicardium.
concinna, Sow.	-	-	-	-	-	N	-	-	-	-	-	W	-	-	-	-	-	-	Tilton, Plungar, Redmile.
copides, da Ryck.	-	-	-	-	-	N Q	-	-	-	-	-	-	-	-	-	-	-	-	Redmile.
gigantea, Quenst.	-	-	-	-	-	N Q	-	-	-	-	-	-	-	-	-	Hn	-	-	Vale of Belvoir.
Listeri, Sow.	-	-	-	-	Q P	N	Q	-	-	-	N	-	-	-	-	Hn L	-	-	Vale of Belvolr, Thurnby, Crown Hill, Loseby.
Listeri, var. **ovalis**, Stutchb.	-	-	-	-	-	N Q	-	-	-	-	-	-	-	-	-	-	-	-	Radmile, Plungar.
var. **hybrida**, Sow.	-	-	-	-	-	N Q	-	-	J	-	-	-	-	-	-	-	-	-	Redmile, Staunton Wyvila
Slatteri, Walford. (*Isocardia.*)	-	-	-	-	-	-	-	-	-	-	-	W	-	-	-	-	-	-	Tilton.
spp.	-	N	-	-	-	-	-	-	-	-	-	-	-	-	-	L	-	-	Granby Barrow.
Cardita																			
multicostata, Phil.	-	-	-	-	-	-	-	-	N	-	-	-	-	-	-	L	-	-	Woolsthorpe Loseby.
Cardium v. Protocardium.																			
Ceromya																			
bombax, Quenst.	-	-	-	-	-	-	-	-	-	-	-	W	-	-	-	-	-	-	Tilton.
liassica, Moore v. C. patricosa.																			
petricosa, Simp.	-	-	-	-	-	-	-	-	-	-	-	N	-	-	-	-	-	-	Eastwell.
Corbicella																			
sp.	-	-	-	-	-	N?	-	-	-	-	-	-	-	-	-	-	-	-	Pluogar.
Cucullæa																			
Munsteri, Ziet.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	L	-	-	Old Dalby.
sp.	-	-	-	-	-	-	-	-	-	-	J	-	-	-	-	-	-	-	Cranhoe.
Cypricardia v. Trapazium.																			
Goniomya																			
heteropleura, Ag.	-	-	-	-	-	-	-	-	-	-	-	W	-	-	-	-	-	-	Tilton.
hybrida, Münst.	-	-	-	-	-	-	-	-	-	Q	N	-	-	-	-	-	-	-	Middle Gonerby
sp.	-	-	-	-	-	-	-	-	-	-	J	-	-	-	-	-	-	-	Billesdon.
Gresslya																			
donaciformis, Phil. (*Myacites*,.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	J N	Thornhaugh, Stoke, Grantham.
intermedia, Simpson	-	-	-	-	-	-	-	-	N S	-	N	W	-	-	-	-	-	-	Broughton, Tilton, John o' Gaunt.
lunulata, Tate	-	-	-	-	P?	-	-	-	-	-	N	W	-	-	-	-	L	-	Thurnby, Tilton.
Seebachi, Brauns	-	-	-	-	-	-	-	-	-	-	N	-	-	-	-	-	-	-	Middle Gonerby
sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	L	-	-	Old Dalby.
Hippopodium																			
ponderosum, Sow.;	-	-	-	-	P	-	Q	J	J	-	J	-	-	-	-	Hn	-	-	Loseby, Saxelby Dalby, Thurnby, Ouston, Ingarsby.
Mytilus hippocampus, Y. & B.	-	-	-	-	Q	-	-	Q	-	-	-	-	-	-	-	L	-	-	
Homomya																			
sp.	-	-	-	-	-	-	-	S	-	-	-	-	-	-	-	-	-	-	Loseby.
Isodonta																			
Ewaldi, Bornemann; *Schizodus (Opis) cloacinus*, Quenst.	-	Ba W B Hn Q L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Spinney Hills, Wigston, East Leake.
Leda v. Nuculana																			
Lucina																			
sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	Grantham.

SPECIES.	Keuper Sandstone.	Rhætic Beds.	Lower.								Middle.		Upper.			Lower Lias.	Middle Lias.	Upper Lias.	LOCALITIES AND REMARKS.
			Am. planorbis.	Am. angulatus.	Am. Bucklandi.	Am. semicostatus.	Am. oxynotus.	Am. armatus.	Am. Jamesoni.	Am. capricornus.	Am. margaritatus	Am. spinatus.	Am. annulatus.	Am. serpentinus.	Am. communis.				
Macrodon																			
Buckmani, Richardson	–	–	–	–	–	–	–	–	–	–	–	W	–	–	–	–	L	–	Tilton.
Modiola																			
hillana, Sow.	–	–	N	–	Q	N Q	–	–	–	J	–	–	–	–	–	Hn L	–	–	Neville Holt, Harbro', Loseby.
hillanoides, Chap. and Dew.	–	–	–	–	P	–	–	–	–	–	–	–	–	–	–	L	–	–	Thurnby, Flecney.
lævis Sow.	–	–	Ba	–	Q	–	–	–	–	–	–	–	–	–	–	–	–	–	Spinney Hills.
minima, Sow.	–	Hn	N Q	–	–	–	–	–	–	–	–	–	–	–	–	L	–	–	Barrow.
Morissi, Oppel	–	–	–	–	–	Q	–	–	–	–	–	–	–	–	–	–	–	–	
numismalis, Oppel	–	–	–	–	–	–	–	–	–	–	–	W N	–	–	–	–	–	–	Tilton. Scalford.
ornata, Moore v. M. subcancellata																			
scalprum, Sow.	–	–	–	N	P Q	N	Q	J Q	N Q? S	J Q	J	W N	–	–	–	Q L	L	–	Abundant.
subcancellata, Buvig.; *M. ornata,* Moore.	–	–	–	–	–	–	–	–		–	–	N W	–	–	–	–	–	–	Woolsthorpe, Tilton.
spp.	–	–	–	–	Q	–	–	–	–	–	–	–	–	–	–	B L	–	–	Leicester.
Myacites donaciformis, Phil. v. Gresslya.																			
Myophoria																			
inflata, Emmerich	–	B	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	East Leake.
Mytilus hippocampus, Y. & B. v. Hippopodium ponderosum.																			
Nucula																			
claviformis, Sow.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	W	–	L	–	Tilton, East Norton.
Hammeri, Defr.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	W	–	–	–	East Norton.
ovum, Sow. v. Nuculana.																			
variabilis, Quenst. [? Sow.]	–	L	–	–	–	–	–	–	–	J Q	–	–	–	–	–	L	–	–	Wigston, Old Dalby, Neville Holt.
spp.	–	–	–	–	–	–	–		–	–	J	–	–	–	–	–	–	J N	Hallaton, Neville Holt, Grantham.
Nuculana (*Leda.*)																			
æquilatera, Koch & Dunker.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	L	–	–	Old Dalby.
complanata, Goldf.	–	–	–	–	–	–	Q	–	–	N	W J	–	–	–	–	–	–	–	Tilton, Belton, Holt, Cranhoe.
Galathea, d'Orb.	–	–	–	–	–	–	Q	–	–	Q	–	–	–	–	–	L	–	–	Great Dalby.
graphica, Tate	–	–	–	–	–	–	–	–	N	–	N	–	–	–	–	L	–	–	Woolsthorpe, Middle Gonerby, Old Dalby.
imbricata, S. & N, M.S., v. N. Quenstedti, Tate																			
minor, Simp.	–	–	–	–	–	–	Q	–	–	N	–	–	–	–	–	–	–	–	Peascliffe.
ovum, Sow. (*Nucula*).	–	–	–	–	–	–	–	–	N	–	–	–	–	–	J N Q	–	–	Hn L Q	Abundant.
Quenstedti Tate; *Leda imbricata,* Sharman & Newton, MS.	–	–	–	–	–	–	–	–	–	–	N	–	–	–	–	–	–	–	Middle Gonerby.
sp.	–	–	–	–	Q	–	–		–	–	–	–	–	–	–	–	–	–	Crown Hill.
Panopæa, v. Arcomya and Pleuromya																			
Pholadomya																			
ambigua, Sow.	–	–		–	–	–	–	J Q	N	–	J	–	–	–	–	L	–	–	Loseby, Ouston, Broughton.

SPECIES.	Keuper Sandstone.	Rhætic Beds.	Lower.								Middle.		Upper.			Lower Lias.	Middle Lias.	Upper Lias.	LOCALITIES AND REMARKS.
			Am. planorbis.	Am. angulatus.	Am. Bucklandi.	Am. semicostatus.	Am. oxynotus.	Am. armatus.	Am. Jamesoni.	Am. capricornus.	Am. margaritatus	Am. spinatus.	Am. annulatus.	Am. serpentinus.	Am. communis.				
decorata, Zeit.	-	-	-	-	-	-	-	-	J Q	-	J	-	-	-	-	-	-	-	Dalby, Ouston.
glabra, Ag.	-	-	-	-	Q	-	-	-	-	-	-	-	-	-	-	-	-	-	
ventricosa, Ag.	-	-	-	-	-	-	Q	-	-	-	-	-	-	-	-	-	-	-	
sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	L	-	-	Barrow.
Pleuromya																			
costata, Y. & B.	-		N	-	-	-	-	-	S	-	-	-	-	-	-	-	-	-	Cold Newton.
striatula, Ag.	-		-	-	Q	-	Q	-	-	-	-	-	-	-	-	-	-	-	
unioides, Roemer	-		N	-	-	N Q	-	-	-	-	N J	-	-	-	-	-	-	-	Ouston,Rocart.
spp.	-	-	-	-	-	-	Q	-	-	-	-	W	-	-	-	-	L	-	Tilton.
Pleurophorus																			
sp.	-		N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Cotham.
Protocardium																			
philippianum, Dunker; *C. rhæticum*, Merian		Pl W N B Hn Q L	-	-	-	-	Q	-	-	-	-	-	-	-	-	L	-	-	Wigston, East Leake, Loseby, Spinney Hills, Old Dalby, etc.
rhæticum, Merian v. P. philippianum.																			
substriatulum, d'Orb.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		L	-	Harlaxton.
truncatum, Sow.	-	-	-	-	-	-	-	-	-	-	L W N S	W? N S	-	-	-	L S	-	-	Abundant.
spp.	-	-	N	-	-	N	-	-	N	-	-	-	-	-	-	L	-	-	
Pullastra																			
arenicola, Strickl.	-	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Schizodus (*Axinus*) *cloacinus* Quenst. v. Isodonta Ewaldi.																			(? *Isodonta*)
depressus, de Kon.	-	Ho	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Spinney Hills.
elongatus, Moore	-	Hn N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Spinney Hills. Cotham.
Tellina																			
gracilis, Dum.	-	-	-	-	-	-	-	-	-	-	-	W	-	-	-	-	-	-	Tilton.
Trapezium, (*Cypricardia*)																			
cordiformis, Desh.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	Stoke.
cucullata, Münst.	-	-	-	-	-	-	-	Q	J	-	-	-	-	-	-	-	-	-	Stapleford.
Unicardium																			
cardioides, Phil.	-	-	-	-	P Q	N Q	Q	Q	J Q	N	N	-	-	-	-	L	-	-	Abundant.
subglobosum, Tate	-	-	-	-	-	-	-	-	-	-	-	W	-	-	-	-	-	-	Tilton.
SCAPHOPODA.																			
Dentalium																			
giganteum, Phil.	-	-	-	-	-	-	-	-	-	N	-	-	-	-	-	-	-	-	Peascliffe.
sp.	-	-	-	-	Q	-	-	-	-	-	-	-	-	-	-	-	-	-	
GASTEROPODA.																			
Actæonina																			
ferrea, Wilson	-	-	-	-	-	-	-	-	-	-	-	W H	-	-	-	-	-	-	Tilton.
fragilis, Dunker	-	-	-	-	-	-	-	-	-	-	-	W	-	-	-	-	-	-	Tilton.
ilminsterensis, Moore	-	-	-	-	-	-	-	-	-	-	-	W H	-	-	-	-	L	-	Tilton, Pickwell.
sinemuriensis Martin (*Actæon*).	-	-	-	-	-	-	-	-	-	-	-	W	-	-	-	-	-	-	Tilton.
Valleti, Stoppani	-	B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	East Leake.
sp.	-	-	-	-	-	-	Q	-	-	-	-	-	-	-	-	-	-	-	
Amberleya (*Eucyclus*)																			
Æolus, d'Orb.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	L	-	Pickwell.
capitanea, Münst.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	H	Market Harbro'.
Chapuisi, Terquem and Piette	-	-	-	-	-	S	-	-	-	-	-	-	-	-	-	-	-	-	Ingarsby.
conspersa Tate	-	-	-	-	-	-	Q	-	-	-	-	-	-	-	-	-	-	-	

SPECIES.	Keuper Sandstone.	Rhætic Beds.	Lower.								Middle.		Upper.			Lower Lias.	Middle Lias.	Upper Lias.	Localities and Remarks.
			Am. planorbis.	Am. angulatus.	Am. Bucklandi.	Am. semicostatus.	Am. oxynotus.	Am. armatus.	Am. Jamesoni.	Am. capricornus.	Am. margaritatus.	Am. spinatus.	Am. annulatus.	Am. serpentinus.	Am. communis.				
Dunkeri, Münster	–	–	–	–	Q	–	–	–	–	–	–	–	–	–	–	L	–	–	Ingarsby.
elegans, Münster	–	–	–	–	Q P	–	–	Q	–	–	–	–	–	–	–	H L	–	–	Old Dalby. Thurnby.
Fidia, d'Orb.	–	–	–	–	–	–	–	–	–	–	–	W H	–	–	–	–	–	–	Tilton.
gaudryana, d'Orb.	–	–	–	–	–	–	Q	–	–	–	–	W H	–	–	–	H	L	–	Tilton.
gaudryana var. imbricata, Sow.	–	–	–	–	–	N Q	Q	–	N J	N S J	N	W	–	–	–	–	L L	–	Tilton, Staunton Wyvile, Harbro'., Hamner's Lodge, Grimston.
undulata, Phil.	–	–	–	–	P	–	–	–	–	–	–	–	–	–	–	L	–	–	Thurnby, Great Dalby, Thorpe Satchville.
spp.	–	–	–	–	–	N	–	–	–	–	N	–	–	–	–	–	–	–	Middle Gonerby.
Ataphrus (*Monodonta*) bullatus, Moore	–	–	–	–	–	–	–	–	–	–	–	W H	–	–	–	–	–	–	Tilton.
lindecolinus, Wilson.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	H	–	Medbourne.
Bourguetia (*Phasianella*) turbinata, Stol.	–	–	–	–	–	–	–	–	–	–	–	W	–	–	–	–	L	–	Tilton, Pickwell. *Pseudomelania*, Wilson.
sp.	–	–	–	–	–	–	–	N	–	–	–	–	–	–	–	–	–	–	Muston.
Cerithium asperulum, Moore	–	–	–	–	–	–	Q	–	–	–	–	–	–	–	–	–	–	–	
camertonense, Moore.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	H L	–	–	Old Dalby.
confusum, Tate v. Cerithinella.																			
costulatum ? Desl.	–	–	–	–	–	–	–	–	–	–	–	W? H	–	–	–	–	–	–	Tilton.
ferreum, Tate	–	–	–	–	–	–	–	–	–	–	–	W H	–	–	–	–	L	–	Tilton.
ibex, Tate	–	–	–	–	–	–	Q	–	–	–	–	–	–	–	–	L	–	–	Old Dalby.
ilminsterense, Moore	–	–	–	–	–	–	–	–	–	–	–	W H	–	–	–	–	–	–	Tilton.
liassicum, Moore	–	–	–	–	–	–	Q	–	–	–	–	W H	–	–	–	L	–	–	Tilton. Old Dalby.
ligaturale, Tate	–	–	–	–	–	N H Q	–	–	–	–	–	–	–	–	–	–	–	–	Redmile.
reticulatum, Desl.	–	–	–	–	–	–	–	–	–	–	–	W H	–	–	–	–	L	–	Tilton. Pickwell.
ubfistulosum, Tate	–	–	–	–	–	N H Q	–	–	–	–	–	–	–	–	–	–	–	–	Redmile.
trigemmatum, Wilson v. Turritella.																			
varicosum, Moore v. Cryptaulax, cf. undulata.																			
spp.	–	–		–	–	–	–	–	–	N ?	–	J	–	–	–	L	–	–	Tilton. Old Dalby.
Cerithinella confusum, Tate	–	–	–	–	–	–	–	–	–	–	–	W H	–	–	–	–	L	–	Tilton. Pickwell.
Chemnitzia Berthaudi, Dum.	–	–	–	–	–	–	Q	–	–	–	–	–	–	–	–	–	–	–	Old Dalby.
Blainvillei, Münster	–	–	–	–	–	–	Q	–	–	–	–	–	–	–	–	L	–	–	Old Dalby.
carusensis, d'Orb.	–	–	–	–	–	–	Q	–	–	–	–	–	–	–	–	–	–	–	
citharella, Tate	–	–	–	–	–	–	Q	–	–	–	–	–	–	–	–	L	–	–	Old Dalby.
periniana ?, d'Orb.	–	–	–	–	–	–	–	–	–	–	–	W	–	–	–	–	–	–	Tilton.
semiteota ?, Tate	–	–	–	–	–	–	Q	–	–	–	–	–	–	–	–	–	–	–	Old Dalby.
undulata ? Benz.	–	–	–	–	–	–	–	–	–	–	–	W	–	–	–	–	–	–	Tilton.
spp.	–	–	–	–	P	N	–	N	–	–	–	–	–	–	–	L	–	–	Thurnby. Old Dalby.

SPECIES.	Keuper Sandstone.	Rhætic Beds.	Lower.								Middle.		Upper.			Lower Lias.	Middle Lias.	Upper Lias.	LOCALITIES AND REMARKS.
			Am. planorbis.	Am. angulatus.	Am. Bucklandi.	Am. semicostatus.	Am. oxynotus.	Am. armatus.	Am. Jamesoni.	Am. capricornus.	Am. margaritatus.	Am. spinatus.	Am. annulatus.	Am. serpentinus.	Am. communis.				
Cryptænia																			
compressa, Sow. (*Helicina*).	-	-	-	-	-		-	-	-	-	Hn	-	-	-	-	-	-	-	Ouston.
consobrina, Tate -	-	-	-	-	-	-	Q	-	-	-	-	-	-	-	-	L	-	-	Old Dalby.
expansa, Sow. (*Helicina*).	-	-	-	-	-	Q N	Q	-	-	-	J H	W H	-	-	-	-	L	-	Tilton, Ouston.
rotellæformis, Dunker	-	-	-	-	-	N	-	-	-	-	-	W H	-	-	-	-	-	-	Plungar. Tilton.
solarioides, Sow. -	-	-	-	-	-	-	-	-	-	-	-	W H	-	-	-	-	-	-	Tilton.
sp. - - - - -	-	-	-	-	Q	-	-	-	-	-	-	-	-	-	-	L	-	-	Kilby.
Cryptaulax																			
cf. undulata Quenst.; *Cerithium varicosum*, Moore	-	-	-	-	-	-	Q	-	-	-	-	-	-	-	-	-	-	-	
Cylindrites																			
æqualis, Wilson -	-	-	-	-	-	-	-	-	-	-	-	W H	-	-	-	-	-	-	Tilton.
Eucyclus v. Amberleya																			
Helicina v. Cryptænia																			
Littorina v. Amberleya																			
Monodonta																			
bullata, Moore v. Ataphrus.																			
humilis, Wilson -	-	-	-	-	-	-	W H	-	-	-	-	-	-	-	-	L	-	-	Old Dalby.
lindecolina, Wilson v. Ataphrus.																			
Nortonia																			
patroclus, d'Orb. (*Purpurina*).	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W	East Norton.
Palæoniso																			
monoplicus, d'Orb. (*Trochus*).	-	-	-	-	-	-	-	-	-	-	N	-	-	-	-	-	-	-	Middle Gonerby.
Phasianella v. Bourguetia.																			
Pleurotomaria																			
anglica, Sow. -	-	-	Ba Q	-	Q	N	Q	-	-	-	-	W	-	-	-	Hn H	-	-	Spinney Hills, Saxelby, Tilton, Old Dalby, Plungar.
canalis, Münster -	-	-	-	-	-	-	-	-	-	-	-	W H	-	-	-	-	-	-	Tilton.
helicinoides, Roem.	-	-	-	-	-	-	-	-	-	-	-	W H	-	-	-	-	-	-	Tilton.
precatoria, Desl. -	-	-	-	-	-	N Q	-	-	-	-	-	-	-	-	-	-	-	-	Redmile.
princeps, K. and D.	-	-	-	-	-	N Q	-	-	-	-	-	-	-	-	-	-	-	-	Redmile.
Quenstedti, Goldf.	-	-	-	-	-	-	-	-	-	-	J	-	-	-	-	-	-	-	Belton.
rustica, Desl. - -	-	-	-	-	-	-	-	-	-	-	-	W H	-	-	-	-	-	-	Tilton.
Pseudomelania																			
brannoviensis, Dum. (*Chemnitzia*)	-	-	-	-	-	-	-	-	-	-	-	W H	-	-	-	-	L	-	Tilton.
turbinata, Stol. v. Bourguetia.																			
sp. - - - - -	-	-	-	-	-	-	-	-	-	-	-	W	-	-	-	-	-	-	Tilton.
Rotella																			
expansa, Sow. v. Cryptænia																			
Trochus																			
Acis, d'Orb. - -	-	-	-	-	-	-	-	-	-	-	N	-	-	-	-	-	-	-	Middle Gonerby.
Æolus, d'Orb. v. Amberleya.																			
Ariel, Dum. -	-	-	-	-	-	-	-	-	-	-	-	W H	-	-	-	-	L	-	Tilton.
dalbiensis, Wilson	-	-	-	-	-	-	W H	-	-	-	-	-	-	-	-	-	-	-	Old Dalby.
Fidia, d'Orb. v. Amberleya.																			

SPECIES.	Keuper Sandstone.	Rhætic Beds.	Lower.								Middle.		Upper.			Lower Lias.	Middle Lias.	Upper Lias.	LOCALITIES AND REMARKS.
			Am. planorbis.	Am. angulatus.	Am. Bucklandi.	Am. semicostatus	Am. oxynotus.	Am. armatus.	Am. Jamesoni.	Am. capricornus.	Am. margaritatus.	Am. spinatus.	Am. annulatus.	Am. serpentinus.	Am. communis.				
imbricatus, Sow. v. Amberleya.																			
lineatus Moore	-	-	-	-	-	-	-	-	-	-	-	W	-	-	-	-	-	-	Tilton.
monoplicus, d'Orb. v. Palæoniso.																			
northamptonensis, Wilson.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W L	Daventry, Tilton.
Œdipus ?, d'Orb.	-	-	-	·	-	-	-	-	-	-	-	-	-	-	-	L	-	-	Old Dalby.
pethertonensis, Moore.	-	-		-	-	-	-	-	-	-	-	W H	-	-	-	-	-	-	Tilton.
rotulus, Stol.	-	-	-	-	-	-	-	-	-	-	-	W H	-	-	-	-	-	-	Tilton.
thetis, Münster	-	-	-	-	-	-	W Q	-	-	N	-	H	-	-	-	L	-	-	Old Dalby. Tilton ?
spp.	-	-	-	-	-	N Q	-	-	-	-	-		-	-	-	Hn	-		Redmile, Saxelby.
Turbo																			
cyclostoma, Benz.	-	-	-	-	-	-	-	-	-	-	-	W H	-	-	-	-	-	-	Tilton.
Dunkeri, Münster v. Amberleya.																			
latilabrus, Stol.	-	-	-		-	-	-	-	-	-	-	W	-	-	-	-	L	-	Tilton, Pickwell.
rugiferus, Moore	-	-	-	-	-	-	-	-	-	-	-	W H	-	-	-	-	-	-	Tilton.
Theodori, Münster	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	W H	Tilton.
spp.	-	-	-	-	-	N Q	-	-	-	-	-	-	-	-	-	L	L	-	Old Dalby, Pickwell.
Turritella (*Cerithium*)																			
trigemmata, Tate	-	-	-	-	-	-	W	-	-	-	-	-	-	-	-	L	-	-	Old Dalby.
spp.	-	-	-	-	-	-	Q	-	-	-	-	-	-	-	-	-	-	-	
CEPHALOPODA.																			
AMMONOIDEA.																			
Ammonites.																			
[*Acanthopleuroceras* v. Cycloceras].																			
[Ægoceras]																			
armatus, Sow.	-	-	-	-	-	-	-	S J Q L	J	-	-	-	-	-	-	Hn L	L	-	Loseby, Dalby, Tilton, Bruntingthorpe.
Birchi, Sow.	-	-	-	-	-	-	-	-	N	-	-	-	-	-	-	-	-	-	Broughton.
brevispinus, Sow.	-	-	-	-	-	-	-	-	S J N Q	N	-	-	-	-	-	-	-	-	Dalby, Stapleford, Twyford, Woolsthorpe.
capricornus, Schloth.	-	-	-	-	-	-	-	-	-	S J Q N	-	-	-	-	-	Hn L	-	-	Abundant.
curvicornis, Schloenb.	-	-	-	-	-	-	Q	-	-	-	-	-	-	-	-	L	-	-	Dalby.
Davœi Sow.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	L	-	-	Old Dalby.
densinodus, Quenst. v. A. obsoletus.																			
gagateus, Y. and B.	-	-	-	-	-	-	-	J	-	N? Q	-	-	-	-	-	L	-	-	Harrowby, Great Dalby.
Henleyi, Sow.	-	-	-	-	-	-	Q	-	-	N Q	J	-	-	-	-	-	-	-	Cranhoe, Peascliffe.
Jamesoni, Sow.	-	-	-	S	-	-	Q	-	J S Q	N	-	-	-	-	-	Hn	-	-	Saxelby, Dalby, John o'Gaunt.
Jamesoni, var. **Bronni** Roemer.	-	-	-	-	-	-	-	-	J	-	-	-	-	-	-	-	-	-	Stapleford.
Jamesoni, var. **confusus**, Quenst.	-	-	-	-	-	-	-	-	J	-	-	-	-	-	-	-	-	-	Stapleford.
latæcosta, Sow.	-	-	-	-	-	-	-	-	J Q	-	-	-	-	-	-	-	-	-	Stapleford, Dalby.

SPECIES.	Keuper Sandstone.	Rhætic Beds.	Lower.								Middle.		Upper.			Lower Lias.	Middle Lias.	Upper Lias.	LOCALITIES AND REMARKS.
			Am. planorbis.	Am. angulatus.	Am. Bucklandi.	Am. semicostatus.	Am. oxynotus.	Am. armatus.	Am. Jamesoni.	Am. capricornus.	Am. margaritatus.	Am. spinatus.	Am. annulatus.	Am. serpentinus.	Am. communis.				
Leckenbyi, Wright.	-	-	-	-	-	-	-	L	-	-		-	-	-	-	-	-	-	Bruntingthorpe.
Maugenesti, d'Orb.	-	-	-	-	-	-	-	-	J	-	-	-	-	-	-	-	-	-	Dalby.
obsoletus, Simp. -	-	-	-	-	-	-	-	-	N S	N	-	-	-	-	-	L ?	-	-	Barrowby, Woolsthorpe, Loseby, Stapleford, Old Dalby, Twyford. Includes *A. densinodus* Quenst.
polymorphus, Quenst.	-	-	-	-	Q	-	-	-	-	-	-		-	-	-	L	-	-	Ingarsby, Old Dalby.
polymorphus, lineatus, Quenst.	-	-	-	-	-	-	-	-	J	-	-	-	-	-	-	-	-	-	Stapleford.
sagittareus - Blake	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	S	-	-	Keyham.
striatus, Rein. -	-	-	-	-	-	-	-	Q	-	-	-	-	-	-	-	L	-	-	Old Dalby.
subplanicosta. Oppel.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	L	-	-	Loseby.
Taylori, Sow. -	-	-	-	-	-	-	Q	-	-	-	-	-	-	-	-	L	-	-	Old Dalby.
[Amaltheus]																			
Engelhardti, d'Orb.	-	-	-	-	-	-	-	-	-	-	N	-	-	-	-	-	-	-	MiddleGonerby
margaritatus, Montf.	-	-	-	-	-	-	-	-	-	-	J W N	W J	-	-	-	-	Hn L S	-	Abundant.
spinatus, Brug. -	-	-	-	-	-	-	-	-	-	-	N	J W	-	-	-	-	L	-	MiddleGonerby Tilton.
trivialis, Simp. -	-	-	-	-	-	-	-	-	J	-	-	-	-	-	-	L S	-	-	Barrowby, Woolsthorpe, Old Dalby, Great Stretton.
[*Amblycoceras* v. Ægoceras]																			
[Arietites]																			
Bonnardi, d'Orb. -	-	-	-	-	S	-	-	-	-	-	Y	-	-	-	-	-	-	-	Frisby bore-hole.
Brooki Sow. -	-	-	-	-	-	-	-	-	-	N	-	-	-	-	-	-	-	-	Barkston.
Bucklandi, Sow. -	-	-	-	-	P Q	N	-	-	-	-	-	-	-	-	-	-	-	-	Thurnby, Broughton.
Conybeari, Sow.	-	-	-	-	P Q	S	-	-	-	-	-	-	-	-	-	Hn L	-	-	Kilby, Ingarsby, Thurnby, Fleckney, Crown Hill.
Macdonnelli, Portl.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	L	-	-	Loseby.
nodotianus, Wr. non d'Orb. v. Macdonnelli																			
obesulus, Blake -	-	-	-	-	P Q	-	-	-	-	-	-		-	-	-	-	-	-	Thurnby.
ophioides, d'Orb. -	-	-	-	-	-	-	-	Q	-	-	-	-	-	-	-	-	-	-	
raricostatus, Zeit. -	-	-	-	-	-	-	N	-	-	-	-	-	-	-	-	S	-	-	Great Stretton,
sauzianus, d'Orb. -	-	-	-	-	P Q	S	-	-	S	-	-	-	-	-	-	L	-	-	Ingarsby, Fleckney.
scipionianus d'Orb. -	-	-	-	-	Q	-	-	-	-	-	-	-	-	-	-	-	-	-	Crown Hill.
semicostatus, Y. & B.	-	-	-	-	P Q	N S Q	-	N	-	N	-	-	-	-	-	Hn S L	-	-	Belvoir, Keyham, Ingarsby Houghton.
subnodosus - Y. & B. -	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	L	-	-	Ingarsby.
tardicrescens, Blake v. Psiloceras aplanatum.																			
Arnioceras v. Arietites																			
[Aspidoceras]																			
bispinosa, Ziet. -	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	L	-	Twyford.
[*Caloceras* v. Psiloceras]																			

SPECIES.			Lower.								Middle.		Upper.						LOCALITIES AND REMARKS.
	Keuper Sandstone.	Rhætic Beds.	Am. planorbis.	Am. angulatus.	Am. Bucklandi.	Am. semicostatus	Am. oxynotus.	Am. armatus.	Am. Jamesoni.	Am. capricornus.	Am. margaritatus.	Am. spinatus.	Am. annulatus.	Am. serpentinus.	Am. communis.	Lower Lias.	Middle Lias.	Upper Lias.	
[Coeloceras]																			
annulatus, Sow.	-	-	-	-	-	-	-	-	-	-	-	J	S J W	-	-	-	L	Hn J N	Abundant.
communis, Sow.	-	-	-	-	-	-	-	-	-	-	-	J W	-	-	W J Q N	-	-	L	Tilton.
crassus, Y.&B.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	L W J N	Tilton, Holt Stoke, Grantham.
Desplacei, d'Orb.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	Stoke, Grantham.
fibulatus, Sow.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	J N L	Market Harbro'.
Holandrei, d'Orb.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	J Q L	Abundant.
raquinianus, d'Orb.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	L	Tilton.
semicelatus, Simp.	-	-	-	-	-	-	-	-	-	-	-	W	-	-	-	-	-	-	Tilton.
Cycloceras]																			
Valdani, d'Orb.	-	-	-	-	-	-	Q	-	J	-	-	-	-	-	-	L	-	-	Old Dalby, Thorpe Langton. *Am. bipunctatus*, recorded by Judd.
[*Dactylioceras* v. Cœloceras]																			
[*Deroceras* v. Ægoceras]																			
[*Grammoceras* v. Harpoceras]																			
Harpoceras]																			
acutus, Tate	-	-	-	-	-	-	-	-	-	-	-	W	-	-	-	-	L	-	Tilton.
bifrons, Brug.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Hn W N J Q L	Abundant.
cæcilia, Rein.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	L	-	Tilton.
complanatus, Brug.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	-	-	-	Grantham.
concavus, Sow.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	J N	-	-	-	Grantham.
elegans, Sow.	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	J N	Holt, Allexton, Stoke.
exaratus, Y. & B.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	L	Market Harbro.
falcifer, Sow; *A. serpentinus*, Auct.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	L N Hn J Q	Abundant.
cf. Levisoni, Simp.	-	-	-	-	-	-	-	-	-	-	-	S	-	-	-	S	-	-	Tilton, Holwell.
lythensis, Y. & B.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	J N	
nitescens, Y. & B.	-	-	-	-	-	-	-	-	-	-	N	-	-	-	-	-	-	-	Middle Gonerby.
normanianus, d'Orb.	-	-	-	-	-	-	-	-	J Q	-	J	-	-	-	-	-	-	-	Dalby, Stapleford, Ouston.
ovatus, Y. & B.	-	-	-	-	-	-	-	-	-	-	-	W	-	-	-	-	-	-	Tilton.
radians, Rein.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N J	Holt, Keythorpe, Scalford.
serpentinus, Auct. v. H. falcifer.																			

SPECIES.	Keuper Sandstone.	Rhætic Beds.	Lower.								Middle.		Upper.			Lower Lias.	Middle Lias.	Upper Lias.	LOCALITIES AND REMARKS
			Am. planorbis.	Am. angulatus.	Am. Bucklandi.	Am. semicostatus.	Am. oxynotus.	Am. armatus.	Am. Jamesoni.	Am. capricornus.	Am. margaritatus.	Am. spinatus.	Am. annulatus.	Am. serpentinus.	Am. communis.				
subplanatus Dum.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	L	Nassington.
Hildoceras v. Harpoceras]																			
[*Liparoceras* v. Ægocerae]																			
[Lytoceras]																			
cornucopia, Y.&B.	-	-	-	-	-	-	-	-	-	S	-	-	-	-	-	-	-	-	Billesdon Coplow. From a well.
fimbriatus, Sow.	-	-	-	-	-	-	-	-	-	J Q	-	-	-	-	-	Hn S	-	-	Holt. Loseby.
[*Microceras* v. Ægoceras]																			
[Oxynoticeras]																			
Coynarti, d'Orb.	-	-	-	-	-	-	-	J	-	-	-	-	-	-	-	-	-	-	Loseby.
guibalianus, d'Orb.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	L	-	-	Loseby.
oxynotus, Quenst.	-	-	-	-	-	-	Q	-	-	N	-	-	-	-	-	L	-	-	Barrowby, Gt. Dalby.
[Phylloceras]																			
heterophyllus, Sow.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N J	Holt.
Loscombei, Sow.	-	-	-	-	-	-	Q	J Q	-	-	-	-	-	-	-	Ho L	-	-	Loseby. Old Dalby.
[Psiloceras]																			
aplanatum, Hyatt (*Caloceras*).	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	L	-	-	Loseby.
Johnstoni, Sow.	-	-	Ba N	-	-	-	-	-	-	-	-	-	-	-	-	L	-	-	Spinney Hills, Barrow.
planorbis, Sow.	-	-	W N B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Wigston, Knighton, Barrow.
tortilis, d'Orb.	-	-	Q	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
torus, d'Orb. v. P. Johnstoni.																			
[Schlotheimia]																			
angulata, Schloth.	-	-	-	B	Q	-	-	-	-	N	-	-	-	-	-	Hn L	-	-	Barrow, Barrowby, Knighton.
catenatus, Sow.	-	-	Ba	Q	P	-	-	-	-	-	-	-	-	-	-	Hn L	-	-	Barrow, Thurnby, Spinney Hills.
BELEMNOIDEA.																			
Belemnites																			
acutus, Miller	-	-	-	-	Q	N Q	Q?	J Q	-	-	-	-	-	-	-	-	-	-	Redmile. Loseby.
apicicurvatus, Blainv.	-	-	-	-	-	-	-	-	-	-	-	W	-	-	-	-	L	-	Tilton.
breviformis, Voltz.	-	-	-	-	-	-	-	-	-	-	-	W	-	-	-	-	-	-	Tilton.
clavatus, Blainv.	-	-	-	-	-	-	J	-	J	J Q	-	J	-	-	-	Hn	-	-	Freeby, Stapleford, Saxelby, Stanton Wyville, Harbro'. Edmondth'rpe
CLAVELLATUS, Bean?	-	-	-	-	-	-	-	-	-	-	-	W	-	-	-	-	-	-	Tilton. ? MS. name.
compressus, Voltz v. Bel. Voltzi.																			
elegans, Simp.	-	-	-	-	-	-	Q	-	J	-	-	-	-	-	-	-	-	-	Stapleford.
elongatus, Miller	-	-	-	-	-	-	-	-	J	-	N J	W J	-	-	-	-	L	-	Thorpe Langton, Tilton, Ouston, Belvoir.
infundibulum, Phil.	-	-	-	-	Q	N	-	-	N	-	-	-	-	-	-	-	-	-	Broughton
irregularis, Schloth.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	J	
levidensis, Simp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	Grantham, Welbourn.
paxillosus, Schloth.	-	-	-	-	-	-	-	-	-	-	J	W J	-	-	-	-	L	-	Billesdon, Tilton, Rocart, Edmondthorpe

SPECIES.			Lower.								Middle.		Upper.						LOCALITIES AND REMARKS.
	Keuper Sandstone.	Rhætic Beds.	Am. planorbis.	Am. angulatus.	Am. Bucklandi.	Am. semicostatus.	Am. oxynotus.	Am. armatus.	Am. Jamesoni.	Am. capricornus.	Am. margaritatus.	Am. spinatus.	Am. annulatus.	Am. serpentinus.	Am. communis.	Lower Lias.	Middle Lias.	Upper Lias.	
subtenuis, Simp.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	W	Tilton.
Voltzi, Phil.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	N J	Grantham, Holt, Manton, Keythorpe, Rockingham, Stamford, Uppingham.
vulgaris, Y & B.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	N	Grantham.
spp.	–	–	–	–	P	–	–	–	N	N	–	–	–	–	–	Hn	Hn	–	
NAUTILOIDEA.																			
Nautilus																			
latidorsatus, d'Orb. v. N. toarcensis.																			
lineatus, Sow.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	N	Grantham.
semistriatus, d'Orb.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	N	Grantham.
striatus, Sow.	–	–	Ba Q	–	P Q	–	–	–	–	–	–	–	–	–	–	Hn	–	N	Stoke, Barrow. Spinney Hills, Thurnby.
toarcensis, d'Orb.; *N. latidorsatus.*	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	N	Stoke.
truncatus, Sow.	–	–	–	–	–	–	–	J Q	–	–	–	W	–	–	–	L	–	–	Loseby, Tilton, Old Dalby.
spp.	–	–	–	–	–	–	–	–	–	–	N	–	–	–	–	Hn	–	S	Billesdon, Loseby, Middle Gonerby.
PISCES.																			
Acrodus																			
keuperinus, Murchison & Strickland (*Hybodus*).	Hn P B L	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Aylestone, Shoulder of Mutton Hill, Leicester. Recorded by Harrison as teeth of Hybodus & Acrodus. "Ichthyodorulites" Plant.
minimus, Ag.	–	B W N Wo L	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Spinney Hills, East Leake, Glen Parva, Barrow.
spp.	Hn	–	–	–	–	B N	–	–	–	–	–	–	–	–	–	–	–	–	Upper Keuper Sandstone (Harrison), Plungar.
ACTINOPTERYGIAN SCALES.	L	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Belonorhynchus																			
acutus, Ag. (*Belonostomus.*)	–	–	Q	Hn B	–	–	–	–	–	–	–	–	–	–	–	L	–	–	Barrow?. May be from Lyme Regis (Woodward).
Belonostomus v. Belonorhynchus.																			
Browneichthys																			
ornatus. Woodward	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Wo L	–	–	Barrow.
Ceratodus																			
latissimus, Ag.; *C. altus,* Ag.	–	Q N Wo B L	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Spinney Hills, Barnston.
Chondrosteus																			
acipenseroides, Egerton, Ag. MS.	–	–	B Wo?	–	–	–	–	–	–	–	–	–	–	–	–	L	–	–	Barrow.
Colobodus																			
frequens, Dames.	B	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Aylestone, Spinney Hills. Scales.

SPECIES.	Keuper Sandstone.	Rhætic Beds.	Lower.								Middle.		Upper.			Lower Lias.	Middle Lias.	Upper Lias.	LOCALITIES AND REMARKS.
			Am. planorbis.	Am. angulatus.	Am. Bucklandi.	Am. semicostatus.	Am. oxynotus.	Am. armatus.	Am. Jamesoni.	Am. capricornus.	Am. margaritatus	Am. spinatus.	Am. annulatus.	Am. serpentinus.	Am. communis.				
maximus, Quenst.	–	B	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Spinney Hills.
Cosmolepis v. Oxygnathus.																			
Dapedius **dorsalis**, Ag. (*Tetragonolepis*)	–	–	B	–	–	–	–	–	–	–	–	–	–	–	–	L	–	–	Barrow.
monilifer, Ag.	–	–	B M Wo	–	–	–	–	–	–	–	–	–	–	–	–	L	–	–	Barrow.
orbis, Ag.	–	–	B M A Hn Wo.	–	–	–	–	–	–	–	–	–	–	–	–	L	–	–	Barrow.
striolatus, Ag. v. D. dorsalis.																			
spp.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	L	–	–	Barrow.
Eugnathus **Hastingsiæ**, Ag. (*Pholidophorus*).	–	–	Wo B	–	–	–	–	–	–	–	–	–	–	–	–	M A	–	–	Barrow. Spinney Hills, Wigston.
serrulatus, Egerton v. Heterolepidotus.																			
Gyrolepis **Alberti**, Ag.	–	Hn Q Wc L B	–	–	–	–	–	–	–	–	–	–	–	–	–	L	–	–	Spinney Hills, Wigston, Barrow.
Quenstedti, Dames	B	B	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Aylestone, East Leake.
Heterolepidotus **serrulatus**, Ag. (*Eugnathus*).	–	–	Q Wo B	–	–	–	–	–	–	–	–	–	–	–	–	L	–	–	Barrow. *Leptolepis sprattiformis*, recorded by Quilter, may be this species. See Browne, Vertebrates of Leicestershire, p. 194.
Hybodus **cloacinus**, Quenst.	–	L Hn Q B Wo	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Spinney Hills. Crown Hills.
minor, Ag.	–	Hn W N Wo B L	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Spinney Hills, East Leake, Barnston.
reticulatus, Ag.	–	N	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Barnston.
spp.	–	B	–	–	B	–	–	–	–	–	–	–	–	–	–	L	–	–	Crown Hill.
Lepidotus v. Heterolepidotus.																			
Leptolepis **concentricus**, Egerton.	–	–	Hn B	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Barrow. ?=*L Bronni*, Ag.
sprattiformis, Blainv. v. Heterolepidotus serrulatus.																			
Mesodon **liassicus**, Egerton.	–	–	M B Wo	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Barrow?
Nemacanthus **monilifer**, Ag.	–	Pl Hn Jm L B	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	Wigston, *Asteracanthus* of Plant's list. See M. Browne, Leicester. Lit. Phil. Soc. 1893, p. 225.

SPECIES.	Keuper Sandstone.	Rhætic Beds.	Lower.								Middle.		Upper.			Lower Lias.	Middle Lias.	Upper Lias.	LOCALITIES AND REMARKS.
			Am. planorbis.	Am. angulatus.	Am. Bucklandi.	Am. semicostatus.	Am. oxynotus.	Am. armatus.	Am. Jamesoni.	Am. capricornus.	Am. margaritatus.	Am. spinatus.	Am. annulatus.	Am. serpentinus.	Am. communis.				
Oxygnathus (*Cosmolepis*). **Egertoni,** Egerton, Ag. MS.	-	-	M A B Wo L	-	-	-	-	-	-	-	-	-	-	-	-	L	-	-	Barrow. See S. Woodward, Ann. Mag. Nat. Hist., 1890, p. 431.
Pholidophorus EGERTONI-	-	-	Q	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Mythical species.
Hastingsiæ, Ag. v. Eugnathus.																			
Higginsi, Egerton	-	L W Hn Wo B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Spinney Hills.
mottiana, Harrison v. Ph. Higginsi.																			
nitidus, Egerton, v. Ph. Higginsi.																			
tricklandi, Ag.	-	-	M A Hn Wo B	-	-	-	-	-	-	-	-	-	-	-	-	L	-	-	Barrow.
sp. (scales)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	B L	-	-	Knighton.
Ptycholepis **minor,** Egerton	-	-	M B Wo	-	-	-	-	-	-	-	-	-	-	-	-	L	-	-	Barrow.
Pycnodus liassicus, v. Mesodon.																			
Sargodon **tomicus,** Plien.	-	Q Wo B L Hn.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Spinney Hills.
Saurichthys **acuminatus,** Ag.	-	L Hn Q W Wo B	-	-	-	-	-	-	-	-	-	-	-	-	-	L	-	-	Wigston, Spinney Hills. Barrow?
apicalis, Ag. v. S. acuminatus.																			
sp.	-	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Barnston.
SELACHIAN SPINES	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Spinney Hills. A. S. Woodward, Leicester Lit. Phil. Soc., 1889, p. 18.
Semionotus **Brodiei,** Newton	Wo	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Colwick Wood, Notts.
Sphenonchus sp.	-	Q	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Spinney Hills. Spines recorded under this name are probably Hybodus.
Undina **barroviensis,** A.S. Woodward; Ann. Mag. Nat. Hist., 1890. p. 436.	-	-	Wo	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Barrow.

SPECIES.			Lower.								Middle.		Upper.						LOCALITIES AND REMARKS.
	Keuper Sandstone.	Rhætic Beds.	Am. planorbis.	Am. angulatus.	Am. Bucklandi.	Am. semicostatus.	Am. oxynotus.	Am. armatus.	Am. Jamesoni.	Am. capricornus.	Am. margaritatus.	Am. spiratus.	Am. annulatus.	Am. serpentinus.	Am. communis.	Lower Lias.	Middle Lias.	Upper Lias.	
REPTILIA and AMPHIBIA.																			
Eretmosaurus rugosus, Owen - (*Plesiosaurus*).	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Wo	-	-	Granby.
Ichthyosaurus communis, Conyb.	-	-	Hn Wo	-	-	-	-	-	-	-	-	-	-	-	-	L	-	-	Barrow.
Conybeari, Lyd. -	-	-	B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Barrow ?
integer, Bronn -	-	-	B	-	-	-	-	-	-	-	-	-	-	-	-	B	-	-	Barrow. Brit. Mus., 33,178.
intermedius, Conyb.	-	-	Hn B Wo	-	-	-	-	-	-	-	-	-	-	-	-	L	-	-	Barrow.
latifrons, Konig. -	-	-	B Wo	-	-	-	-	-	-	-	-	-	-	-	-	L	-	-	Barrow.
platyodon, Conyb.	-	-	A B	-	-	-	-	-	-	-	-	-	-	-	-	-	-		Barrow ?
tenuirostris, Conyb.	-	-	Hn N B Wo	-	-	-	-	-	-	-	-	-	-	-	-	L	-	-	Barrow.
zetlandicus ? Seeley	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	B Wo	Vale of Belvoir.
spp. - - - - -	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	B Bm. L	-	-	Seagrave. Oxford Museum.
(VERTEBRÆ, ETC.) -	-	Hn	-	-	P	-	-	-	-	-	W	-	-	-	-	-	-	N	Spinney Hills, Thurnby, Tilton, Grantham
Labyrinthodon spp. - - - -	-	Hn B Jm	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Spinney Hills, Wigston, East Leake.
FOOTPRINTS - - -	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Weston Cliff. In Keuper Sandstone, Hull, Geol. of Leicestershire Coalfield, p. 62.
Plesiosaurus Dewalquei ? Van Beneden.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	B	-	-	Barrow, Bm. (R 1440).
Hawkinsi ? Owen -	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	B Wo	-	-	Beanington Lincolnshire. Bm (R 45).
macrocephalus, Buckl.	·	-	A B Hn	..	-	-	-	-	-	-	-	-	-	-	-	L	-	-	Barrow. Recorded in error under the name *Pl. megacephalus* by Ansted and Quilter.
megacephalus v. Thaumatosaurus.																			
(VERTEBRÆ, ETC.) -	-	Hn	B Q N	-	-	-	-	-	-	-	-	-	-	-	-	L	-	-	Spinney Hills, Barrow, Barnston.
Rysosteus Oweni W. and S. -	-	B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	East Leake.
TANYSTROPHŒUS, von Meyer, *See* Woodward and Sherborn, Fossil Vert., 1890.																			Error : Bone recorded by J. Plant from the Keuper of Leicester.
Thaumatosaurus megacephalus, Stutchbury (*Plesiosaurus*).	-	-	B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Barrow. Dublin Museum. May be *P. macrocephalus*. See Browne L. Vert., p. 180.

APPENDIX III.

ON THE MICROSCOPIC CHARACTER OF SOME OF THE BOULDERS, AND ROCK SPECIMENS FROM BORINGS, BY DR. J. S. FLETT, M.A.

The Humber Stone, Holystone, Hellstone or Holstone. E.3408. —This is a biotite granite essentially composed of quartz, orthoclase, plagioclase and biotite, which last is often weathered into chlorite and epidote. It contains also a few crystals of a pale green, not very dichroic hornblende, some sphene, epidote, zircon, apatite and iron oxides. Orthoclase is abundant in large irregular crystals often perlitic and sometimes zonal. The plagioclase is near oligoclase. The structure is that which is usual in rocks of this group; but the felspars occasionally show a tendency to become porphyritic.

Aylestone. E.3410.—A rather decomposed syenite, the principal ingredients of which are felspar and hornblende. The felspar is to a large extent plagioclase, but orthoclase is also plentiful; both are much decomposed, and the former is in idiomorphic crystals with rectangular sections, the orthoclase more irregular in shape and often surrounding the plagioclase. There is fresh hornblende which shows the characteristic transverse section, and is brownish-green with exceptionally little dichroism. The abundant epidote and chlorite are probably mainly due to the decomposition of the hornblende. There is a small amount of interstitial quartz sometimes in rude graphic intergrowth with the felspar. In one or two places aureoles of micropegmatite surround felspar crystals. Epidote is present in grains and divergent fibrous aggregates. Accessories: apatite, sphene, magnetite, zircon. The rock is almost a quartz diorite.

St. John's Stone, Leicester Abbey. E.3411.—A calcareous grit which contains in a calcareous cementing matrix rounded and subangular grains of quartz, weathered felspar, flint or chert and other materials often stained red with encrusting oxide of iron. The grains are rather large (5 mm. across average), the calcareous cement very abundant.

The Moody Bush Stone, New York Farm, near Syston. E.3409 —A rather coarse-grained andesitic tuff. It contains a good deal of epidote which colours it green in spots, but is otherwise remarkably fresh and the felspars of the lapilli well preserved. These lapilli are of various kinds but may all be grouped under the term andesite, though some might possibly be better called trachytes. Their ferro-magnesian minerals have all decomposed into epidote, limonite, etc.

Countesthorpe Cottage Homes. (From a boring at 170 feet ?)* E.3412.—A fine-grained felsitic rock consisting principally of a microcrystalline or micrograniticaggregate of quartz and felspar. It is not porphyritic, the groundmass is filled with scales of secondary muscovite. It has in places a nodular character, recalling that of ash beds, but in the thinnest parts of the section some of these nodules have a radiate structure, resembling devitrified spherulites. I think it is an old acid lava or intrusive vein.

---

* From a core supplied by Mr. J. D. Paul, who states that it was obtained from a boring made at this place in 1884, and carried to a depth of 170 feet. [? yards.]

Knighton Fields, Co-operative Boot Works. (From a boring at 690 feet.) E.3413.—This fine-grained soft grey rock, so far as is shown by the micro-sections, is composed of fine scaly muscovite, minute grains of quartz, spots of calcite or carbonates, and a diffused green mineral which is probably chlorite. In addition to these there is apparently a good deal of kaolin. From its composition it is a mudstone or clay rock, slightly calcareous but in no sense a limestone.

E.3414 (at 720 feet) and E.3415 (at 750 feet) have a spotted nodular character which suggest that the rock may be a fine-grained thoroughly decomposed tuff, but no volcanic minerals or structures are to be recognised in the specimens.

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